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Award Number:
W81XWH-06-2-0034

TITLE:
ICU Multipoint Military Pacific Consultation using Telehealth (IMMPACT)

PRINCIPAL INVESTIGATOR:
Benjamin W. Berg, MD

CONTRACTING ORGANIZATION:
University of Hawaii
Honolulu, HI 96813

REPORT DATE:
May 2010

TYPE OF REPORT:
Final

PREPARED FOR: U.S. Army Medical Research and Materiel Command
Fort Detrick, Maryland 21702-5012

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6. AUTHOR(S)

Benjamin W. Berg, M.D.

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5e. TASK NUMBER

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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

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14. ABSTRACT: Remote real-time critical care consultation was provided from an eICU™®, located at Tripler Army Medical Center (TAMC), to US Army 121st Combat Support Hospital/ Brian Allgood Army Community Hospital [BAACH]), Seoul Korea; and Guam Naval Hospital. A total of 264 consults were completed. Requesting services were IM,FP, Peds, & Surgery. CCM and Cardiology were most frequently consulted. The eSearch™ e Analysis and Reporting system was installed. A DIACAP eICU system feasibility study revealed multiple DIACAP liabilities in the eICU system. Acoustic Trauma educational material was completed. Research specified in this contract was completed at TAMC and BAACH under IRB approval. Research shows similar team performance during simulated manikin resuscitation comparing teams with co-trained "local" versus "foreign" physicain team leaders, and telepresent versus on-site physician leader. Conclusion: Real-time remote critical care telehealth consultation is feasible in an MTF. Simulated clincal resuscitation performance is comparable comparing telepresent versus on-site team leader location. Remote simulation is a feasible technique for ICU training and evaluation.

15. SUBJECT TERMS
Critical care, Military Pacific, ICU, Telehealth, Telemedicine, Simulation

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			USAMRMC
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Standard Form 298 (Rev. 8-98)
Prescribed by ANSI Std. Z39.18

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INTRODUCTION

Critical care specialist shortages have been identified as a critical physician manpower issue in the United States, and standards for availability of critical care specialists demand alternate solutions to continuous on-site critical care specialists. Telemedicine is one model of healthcare delivery which by design may address the shortage of critical care specialists, and has been variably reported to show significantly improved outcomes in clinical and process domains in some reports, and recently as showing no significant mortality differences in pooled data analysis.

This project was designed to install, and operate a remote critical care consultation service by a remote telemedicine system between a hub at Tripler Army Medical Center (TAMC) in Honolulu, Hawaii and two remote intensive care units, at small military treatment facilities outside of the continental United States (OCONUS). Critical care specialists are not routinely assigned to the remote facilities. Critical care specialists are available at TAMC to provide consultative services. The remote facilities are Naval Hospital, Guam (NHG), and Brian Allgood Community Hospital (BAACH) in Seoul, South Korea. BAACH was renamed during the interval of this project, and is specified as the US Army 121 Combat Support Hospital in the contract documents. The project research objectives were focused on demonstrating a practical approach to delivery of critical care consultation by telemedicine using a commercially available critical care telemedicine system, eICU®. The project partner for provision of the eICU® system was specified as VISICU, Inc (Baltimore MD). VISICU, Inc was acquired during this project, and is now managed as Philips VISICU. The eICU system was utilized in this project for delivery of clinical services and for the conduct of research.

Critical care research is complex and is difficult to execute in small community hospitals, where low patient census precludes conducting outcomes studies which are adequately powered to make valid conclusions. Simulation based training and evaluation is increasingly recognized and validated as a tool that overcomes barriers to providing quality healthcare training and conducting research with patients. Assessment of simulation based outcomes is one potential methodology that could overcome barriers to the study of telemedicine in critical care.

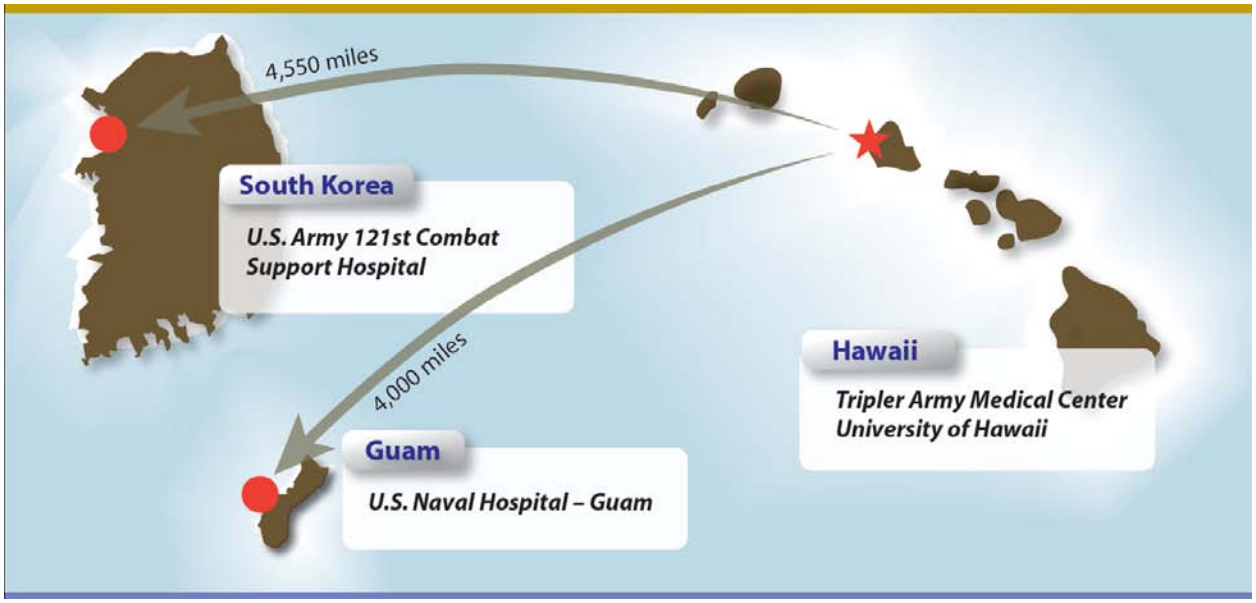
Research was designed to evaluate the feasibility of conducting remote simulation based healthcare team resuscitation evaluation using high fidelity manikins. The research was designed furthermore to evaluate the performance of healthcare provider team conducting simulated resuscitation, comparing two principle experimental differences. First, team baseline performance was compared to subsequent performance when the physician team leader was remotely located and participating by telepresence, using the eICU system. Second, the team performance with a remotely located physician team leader was evaluated for differences when a remotely located telepresent physician team leader was a physician who had previously trained with the resuscitation team, versus one who had not previously worked with the resuscitation team.

The design of this project allowed assessment of the clinical use patterns for a consultative critical care service from a Military Medical Center to a smaller community hospital, where ICU census and severity of illness is relatively low. The research allowed study of a unique

methodology for study of telehealth initiatives, comparing remote and on-site activities using simulation. There is limited experience or research using remote simulation, however there is robust data that supports the use of simulation based methods for resuscitation training and evaluation. Simulation based resuscitation performance is correlated with clinical performance.

This final report is structured to provide itemized documentation of the award specified deliverables. Multiple contract modifications and extensions are reflected in the material provided for this review. The initial project specified clinical services and research conducted at both NHG and BAACH. Staffing levels at NHG and clinical operations precluded participation in research after installation of the eICU system and commencement of remote clinical consultation services from TAMC. Remote critical care consultation services were continued between TAMC and NHG for the duration of this project, at no cost to the project following withdrawal of NHG from the research project. Clinical results are reported for both NHG and BAACH.

“IMMPACT” deliverables represent pre contract modification deliverable that carried through the entire project. “IMMPACT II” deliverables represent those modified and/or added by cited contract modifications.



BODY

STATUS OF SPECIFIED DELIVERABLES:

"IMMPACT II" SOW (Contract Mod)
POP: 1 September 2007 - 31 October 2009 (No-cost extension)

Year I

Technical

1. Complete DOD information assurance certification and accreditation process (DIACAP) implementation plan and conclude a Certification Determination and Accreditation Decision. - Completed
2. Implement eICU™ system enhancements for routine automated clinical data search and reporting functions. – Completed

FINAL REPORT STATUS:

a. DIACAP reporting and recommendations were completed by VISICU subcontractor Lunarline as reported in the Q16 report. Deliverables, consisting of Security Assessment results and DIACAP Package Components (including the Certification and Accreditation (C&A) Strategy Document and templates for the development of C&A process) were received on March 17, 2010 from VISICU. Results of the DIACAP Feasibility effort showed that there were no issues that would preclude the accreditation through DoD services, although some corrections would be necessary before the system baseline is prepared to apply for accreditation. The study identified 57 Category I (severe) findings, 370 category II findings (moderate), and 77 Category III (low) findings of system vulnerabilities which would need to be addressed for consideration of a DIACAP Mission Assurance Category (MAC) II. VISICU determined that DIACAP certification would require substantial resources for a DIACAP compliant eICU system revision, and that the report would be integrated into the company's strategic planning objectives. No determination to proceed with or to preclude a DIACAP certification program was established.

b. Tripler Army Medical Center issued two Interim Authority to Operate (IATO) determinations during this project.

c. The eICU™ "eSearch" functionality installation program was completed in September 2008 by VISICU. Contract and system activation documents were included in Appendix A-8 of the 2009 Annual Report.

Clinical

- No clinical activities will be directly supported through this project during year 1 - Completed

FINAL REPORT STATUS:

a. No clinical activities were supported through the IMMPACT II modification resources. IMMPACT SOW clinical activities tasks were completed for the award period and are reported below.

Research

- Secure IRB approvals and CRADA for exempt educational research at participating institutions – Completed

FINAL REPORT STATUS:

a. Exempt IRB protocols were approved by University of Hawaii on 17 July 2008, Tripler Army Medical Center (TAMC) on 19 September 2008, and Human Research Protection Office (HRPO) and Medical Material & Research Command (MMRC) on 17 December 2008. Exempt protocol documents and start letters from each institution were included in Appendix A-4 of the 2009 Annual Report.

b. The CRADA between US Army Clinical Investigation Regulatory Office (CIRO) and Research Corporation of the University of Hawaii (RCUH) was accepted on 24 November 2008 and assigned Army Control Number 0811-T-C942. The CRADA document was submitted in the 2009 Annual Report (Appendix A-3). An amendment to the CRADA was completed on May 12, 2010 to modify the travel fee amount from $65,106 to $47,188. Please see Appendix A-1 for CRADA Amendment 1.

YEAR II

Reporting Interval: This reporting interval begins on 1 September 2008

Technical

- Maintain uninterrupted remote critical care services from TAMC eICU to BAACH – Completed
- Format and integrate routine reporting formats and protocols for eICU (TAMC) and ICU (BAACH) process improvement and internal organizational audit procedures – Completed

FINAL REPORT STATUS:

a. Remote critical care services from TAMC eICU to BAACH have been completed for the award period. Technical and monthly detailed operations reports were included in each quarterly and annual report during the award POP. Please see Appendix A-2 for February - March 2010 reports and Appendix A-3 for eICU Program Operational Documentation.

b. Customized process improvement report capabilities were developed and implemented at the end of September 2008 by subcontractor VISICU with the installation of eSearch™ and 3.6 eCare Manager system upgrade. Customized eSearch reports were included in Appendix A-7 of the 2009 Annual Report. Training was provided by VISICU for TAMC and BAACH users. Services were provided through the end of award POP.

Clinical

- Provide continuity training for staff at participating institutions – Completed
- Continue remote critical care consultative services at BAACH – Completed
- Provide required clinical reports and process improvement clinical tracking information from eSearch™ project.- Completed

FINAL REPORT STATUS:

a. FCCS training at BAACH was conducted four times during the POP, providing baseline training for participants in the research data collection phase of the project. Training was conducted during the following months: March 2007, Sept 2007, Sept 2008 and Nov 2009.
b. Remote critical care consultative services at BAACH were provided throughout the award POP.
c. eSearch™ reporting capability commenced in September 2008.

Research

- Conduct Human Patient Simulator (HPS) scenario based interdisciplinary team performance assessment research at TAMC and BAACH – Completed
- Conduct multi-site crossover evaluation of team performance comparing physician team member participation on-site, versus telepresent "foreign" physician team member participation, utilizing the eICU interface. - Completed

FINAL REPORT STATUS:

a. Forty-two planned crisis team scenarios were completed for the research component of the project. Data collection was completed in September of 2009 and materials included in Appendix A-6 of the 2009 Annual Report.
b. University of Hawaii faculty and the PI have delivered Crisis Team Training Curriculum to over 400 military personnel at the University of Hawaii. This prepared the instructors for execution of the simulation based crisis team-training component of the IMMPACT research program.
c. Fundamental Critical Care Support (FCCS) training was conducted at BAACH four times during the POP, as referenced in the Clinical section above. This element provided baseline institutional training for participants in the IMMPACT research protocol, and supported the clinical eICU services.
d. IRB exempt protocol was granted by Tripler Army Medical Center IRB, University of Hawaii IRB and HRPO IRB. CRADA between The US Army Clinical Investigation Regulatory Office (CIRO) and the Research Corporation of the University of Hawaii was executed.
e. The research element for remote participation using the system for resuscitation team leadership utilized both travel to Hawaii and local eICU™ capabilities for TAMC and BAACH physicians as discussed in the 2009 Annual Report. Telepresent participant activities for local physicians at BAACH were conducted remotely, from both an on-site eICU™ location at BAACH, and from the TAMC eICU. TAMC based

telepresent physicians participated in remote research sessions from the eICU™ at TAMC.

f. RESEARCH FINDINGS:

The principle research findings from this project allow the following conclusions:

- Remote critical care consultation is feasible, practical, and a valued service which was used 264 times during this project. There were several intervals of relatively low consultative demand from NHG and BAACH. These intervals reflected low census intervals or intervals during which an on-site critical care practitioner was available. The development of standardized referral criteria was accomplished in the first year of clinical activity, and integrated into ICU standard operating procedures. The criteria were however infrequently referenced or utilized in selection of patients for critical care consultation. This was likely the result of physician and nursing staff turnover, unfamiliarity with the criteria, and incomplete on-site orientation to the eICU and TAMC consultation service. The primary requesting disciplines were Internal Medicine (60%), Family Medicine (19%), Pediatrics (11%), and Surgery (8%). The remainder of consults were requested by Surgery, obstetrics, and critical care practitioners. A mass casualty assistance was completed at Naval Hospital Guam in December 2006 (see Appendix A-4).
- The simulation based research completed at BAACH comprised 14 discrete data collection sessions, and enrolled a total of 70 subjects who were members of 42 complete resuscitation teams, each team comprised of 4 providers. No two teams were comprised of an identical member composition. The subjects completed baseline didactic training and three facilitated and debriefed resuscitation simulation scenarios completed in an ICU room at BAACH. Following baseline training, each team completed two scenarios in a randomly selected order. No feedback or debriefing was provided. Data collected from team performance included 12 discrete elements, six in the “Intervention” domain, and six in the “Assessment” domain. Two primary cohorts were defined for the data collection, based on the status of the remote scenario team leader during subsequently completed remote resuscitation scenarios. One group of teams which completed remote scenarios with a non-co-trained (“foreign”) physician team leader, and one group of teams completed remote scenarios with a co-trained (“local”) physician team leader. Primary data points represented a) time to task completion and b) an ordinal performance score (success/partial success/non-success) for each of the 12 items. Two outcomes were evaluated: 1) Are there team performance differences between on-site or off-site physician participation; 2) Are there team performance differences between co-trained or non-co-trained physician participation. Analysis methods included linear (completion time) and logistic (score) regression models with random effects for set and team were used to account for the nesting structure of the data. The fixed effects were timepoint, group, their interaction, scenario, and scenario order. The overall data analysis revealed no overall clinically significant performance differences associated with the telepresent versus on site-physician team leader, or between co-trained and non-co-trained (“foreign”) physician team leadership. The basic

analysis was constructed to detected differences between cohorts in differences between on-site and off-site physician leader location, for each parameter analyzed. Several individual time parameters demonstrated statistically positive but clinically insignificant differences, such as 20 to 40 second differences in intubation times for on-site versus off-site values in the co-trained versus non-co-trained team leader cohorts. A complete report of the research methods, analysis, and data is included in Appendix A-5.

"IMMPACT" ORIGINAL SOW
Modified POP: 1 September 2007 - 31 October 2009

YEAR II
Technical

- Maintain uninterrupted remote critical care services from TAMC eICU™® to Naval Hospital Guam (NHG) and BAACH - Completed

FINAL REPORT STATUS:
Please review "IMMPACT II" SOW (Contract Mod) – Year II Technical section above.

Clinical

- Provide continuity training for staff at participating institutions - Completed
- Continue remote critical care consultative services at NHG – Not completed
- Continue remote critical care consultative services at the BAACH - Completed
- Provide Fundamental Critical Care Support (FCCS) training to clinical staff at 121CSH and NHG – Completed for BAACH
- Provide physician "backfill" for TAMC critical care services - Completed

FINAL REPORT STATUS:
Each Task has been completed and is documented in the narrative below.

a. NHG eICU™ activities were not supported by the IMMPACT project as reported in the 2008 Annual Report.

b. Clinical activity was detailed in the monthly operations reports in the previously submitted quarterly and annual reports.

c. On-site and remote training for BAACH Hospital staff was conducted throughout the award POP for all incoming ICU staff. The onsite program coordinator (Ms. Kalleberg RN) conducted on-site training, and the eICU technical director (Mr. Sellner) conducted remote system training. Mr. Sellner conducted comprehensive system training for Ms. Kalleberg.

d. Fundamental Critical Care Support training was conducted at BAACH four times during the POP. Course faculty were drawn from certified course instructors at the University of Hawaii and Tripler Army Medical Center.

e. Dr. Berg (PI) provided ongoing research physician support at Tripler Army Medical Center and BAACH.

Research

- Conduct HPS scenario based interdisciplinary team training and assessment at BAACH – Completed
- Conduct multi-site crossover evaluation of team performance comparing physician team member participation on-site, versus remote physician team member participation, utilizing the eICU™® interface – Completed

FINAL REPORT STATUS:
The tasks identified in the SOW were reconfigured in the IMMPACT II contract modification due to withdrawal of the Naval Hospital Guam clinical site, as reported in previous annual reports. Research-related activity is reviewed in the above section "IMMPACT II SOW" Year II Research.

"Acoustic Trauma"
POP: 1 February 2009 - 1 May 2009.

Statement of work:
1. Develop a comprehensive Principles of Acoustic Trauma curriculum for education and training of non-ENT, non-audiologist providers.

Deliverables:
1. A didactic program of self-directed knowledge acquisition which can be delivered using a distance learning management system.
   a. A narrated Power Point Presentation. Delivered in native Power Point format and a narrated Articulate software package for web delivery.
   b. Pre-test
   c. Post-test
2. An academic report suitable for publication: "Principles of Acoustic Trauma for the non-specialist."
3. A comprehensive current Principles of Acoustic Trauma annotated bibliography.

FINAL REPORT STATUS:
The work specified in the SOW was completed by subject matter expert Dr. Michael Holtel and all specified deliverables received in July 2009. Deliverables were included in Appendix II of the Q13 report.

KEY RESEARCH ACCOMPLISHMENTS

The accomplishments reported during this award period are related to establishment and maintenance of the necessary infrastructure, training, and coordination for collection of research

data. Research data collection and analysis were completed. The accomplishments that support this are listed below:

- Protocol submittal to and approval by TAMC IRB, UH IRB and HRPO IRB
- Approval of CRADA between CIRO and RCUH. An amendment of the CRADA was approved in May 2010 to change the travel fee amount.
- FCCS Trainings completed as scheduled at BAACH
- Simulation-based training faculty completed necessary experience with simulation based CTT training to conduct specified IMMPACT research
- Recruited nurses, physicians and respiratory therapists to participate in the crisis team training data collections.
- Completion of twelve scheduled on-site and remote data collection sessions at BAACH and TAMC.
- Data extraction and collation was completed as detailed in the Q16 report.
- Data analysis was completed for all data collection sets by University of Pittsburgh Center for Research on Health Care Data Center.
- Manuscript preparation and submission is ongoing. Abstract submitted to May 2010 American Thoracic Society International Conference was not accepted as reported in Q16 report.

REPORTABLE OUTCOMES

1. The original contract was modified 18 July 2007 to increase FY06 funds in the amount of $841,498.31, increasing the total award amount to $4,200,498.31. Contract modification was included in the 2008 Annual Report.
2. The original contract was modified to extend the POP to October 30, 2009, as referenced in the 2008 Annual Report.
3. The original IMMPACT contract was modified to include a 90-day task (beginning 1 February 2009) for the hiring of a subject matter expert on acoustic trauma. Please refer to Appendix A-1 of 2009 Annual Report for Contract Modification.
4. A six month no-cost extension was approved on 8 Sept 09 as detailed in the Q14 report.
5. A one month no-cost extension was approved on 17 Dec 09 as detailed in the Q15 report.
6. Naval Hospital Guam withdrew as a participant in the research program as referenced in the 2007 Annual Report. Revised program of research was designed to complete the original SOW to be conducted at TAMC and 121 Combat Support Hospital (now BAACH).
7. Installation of the eSearch™ Analysis and Reporting system and 3.6 eCare Manager system upgrade at TAMC was completed.
8. IRB protocols were approved by TAMC, UH and HRPO.

9. CRADA between CIRO and RCUH was obtained. An amendment was made to the CRADA in May 2010 to change the travel fee amount.
10. Technology Readiness Level (TRL) rating information requested by TATRC for MRMC and Technology Integration General Officer Steering Committee (TIGOSC) was submitted on 23 October 2008. Please see Appendix A-11 of 2009 Annual Report.
11. Provided estimates from subcontractor, VISICU, to Naval Hospital, Okinawa, Japan for upgrade quote for all new eICU™ equipment, annual sustainment costs and eCare Manager. Please see Appendix A-8 of 2009 Annual Report.
12. Statisticians from the Center for Research on Health Care Data Center at the University of Pittsburgh Center were hired to complete research data analysis from January 1-May 31, 2010.
13. All equipment installed in the eICUs for the purpose of the project at TAMC, BAACH and NHG have been donated by University of Hawaii and transferred to each hospital. Please see Appendix A-6 for equipment transfer letters for each institution.
14. All invoices for subcontractor VISICU have been paid for eSearch and DIACAP contracts. Final tax clearance from VISICU was obtained for final invoice payments.
15. All invoices for subcontractor University of Pittsburgh have been paid for data analysis work.
16. Project closeout team meetings were held in February 2010 as detailed in Q16 report.
17. Quarterly Standard 272 and 425 forms were submitted to the USAMRAA contract specialist throughout the POP.

BIBLIOGRAPHY OF ALL PUBLICATIONS AND MEETING ABSTRACTS

1. Product Line Review – TATRC programmatic review November 8, 2007. Ft. Detrick MD. Benjamin W Berg, PI

2. American Telemedicine Association. April 5-8, 2008. Invited Panel Presentation: "*e*ICU Impact in the Military". LTC Eric Crawley, Military Site Protocol PI. Date of presentation April 8, 2008

3. 2nd Annual Wiser Symposium on Nursing Simulation (Planned Presentation). December 4-5, 2007. "Remote Manikin Based Nursing Education" Benjamin W. Berg PI. Lorrie Wong RN

4. University of Pittsburgh School of Nursing Emerging Learning and Integrated Technologies Education program Dissemination Conference: "The Bleeding Edge of Distance Learning." June 3, 2008. Benjamin W. Berg, MD

5. Fundamental Critical Care Support course presentations and simulation scenarios

conducted in support of the IMMPACT program. March 2007, Sept 2007, Sept 2008 and Nov 2009. Dr. Eric Crawley, Dr. Donald Helman, Dr. Benjamin Berg

6. May 6 2009: Dr. Benjamin Berg- University of Pittsburgh Medical School. Safar Center for Resuscitation Research. Annual Research Symposium. “Simulation at a distance – Friend or Foe?”

UPDATED BIBLIOGRAPHY FOR REMOTE CRITICAL CARE AND REMOTE SIMULATION TOPICS

Thomas EJ, Lucke JF, Wueste L, Weavind L, Patel B. Association of telemedicine for remote monitoring of intensive care patients with mortality, complications, and length of stay.JAMA. 2009 Dec 23;302(24):2671-8.

Morrison JL, Cai Q, Davis N, Yan Y, Berbaum ML, Ries M, Solomon G.Clinical and economic outcomes of the electronic intensive care unit: results from two community hospitals.Crit Care Med. 2010 Jan;38(1):2-8.

Kneebone R, Bello F, Nestel D, Mooney N, Codling A, Yadollahi F, Tierney T, Wilcockson D, Darzi D. Learner-centred feedback using remote assessment of clinical procedures. Med Teach. 2008;30(8):795-801.

Wilson LS. Technologies for complex and critical care telemedicine. Stud Health Technol Inform. 2008;131:117-30.

Stafford TB, Myers MA, Young A, Foster JG, Huber JT. Working in an eICU unit: life in the box. Crit Care Nurs Clin North Am. 2008 Dec;20(4):441-50.

Rajecki R. eICU: Big brother, great friend. Remote monitoring of patients is a boon for nurses, patients, and families. RN. 2008 Nov;71(11):36-9

Meidl TM, Woller TW, Iglar AM, Brierton DG. Implementation of pharmacy services in a telemedicine intensive care unit. Am J Health Syst Pharm. 2008 Aug 1;65(15):1464-9

Zawada ET Jr, Kapaska D, Herr P, Aaronson M, Bennett J, Hurley B, Bishop D, Dagher H, Kovaleski D, Melanson T, Burdge K, Johnson T; Avera eICU Research Group. Prognostic outcomes after the initiation of an electronic telemedicine intensive care unit (eICU) in a rural health system. S D Med. 2006 Sep;59(9):391-3.

Leong JR, Sirio CA, Rotondi AJ. eICU program favorably affects clinical and economic outcomes. Crit Care. 2005 Sep 8;9(5)

PERSONNEL RECEIVING PAY FROM THE RESEARCH EFFORT

- Dr. Benjamin Berg
- Don Hudson
- Dan Horne
- Dr. Michael Holtel
- Eileen Beamis Maeda
- Dr. Lawrence Burgess
- Dolly Puchert
- Kristen Okahashi
- Kris Hara
- Dr. Deborah Berkmire-Peters
- Michael von Platen
- Laurie Kalleberg
- Dr. Victoria Garshnek
- Steven Sellner
- Moy Drake
- John Draude

IMMPACT
FINAL REPORT 2010

APPENDIX
A-1

AMENDMENT #1
for
ADTTP Army Control # 0811-T-C942

Amendment #1 for Statement of Work (SOW) under Cooperative Research and Development Agreement (CRADA) No. 0811-T-C942 between Clinical Investigation Regulatory Office (CIRO) and the Research Corporation of the University of Hawaii, John A. Burns School of Medicine (UH-JABSOM) for the project titled: " ICU Multipoint Military Pacific Consultation Using Telehealth (IMMPACT)" by LTC Eric Crawley, MC.

1. The Parties agree to amend the SOW for the above referenced CRADA by changing the following paragraphs:

a. **Paragraph D.3. is changed to read:**

D.3 All performances under this SOW will cease at either the completion of all work, exhaustion of funds, unilateral or mutual termination, or May 31, 2010, whichever comes first.

It previously read:

D.3. All performances under this SOW will cease at either the completion of all work, exhaustion of funds, unilateral or mutual termination, or October 30, 2009, whichever comes first.

b. **Paragraph E.10 is changed to read:**

E.10. Travel:	$47,188.00 for travel by TAMC staff to support study related travel expenses via funds in accordance with Federal Joint Travel Regulations

It previously read:

E.10. Travel:	$65,106.00 for travel by TAMC staff to support data collection at remote research location via funds in accordance with Federal Joint Travel Regulations

c. **Paragraph E.15 is changed to read:**

E.15. Payment Schedule. The Collaborating Party will provide direct contract funding to TAMC for $53,698.60. The Collaborating Party shall provide funds for goods and services upon receipt of invoices. The Collaborating Party will remit checks to TAMC made payable to "Treasurer of the United States" within 30 days of receipt of invoices. Funds for expenses will be deposited in a distinct Department of the Army account under control of the Directorate of Resource Management, and managed by the Department of Clinical Investigation, TAMC.

It previously read:

E.15. Payment Schedule. The Collaborating Party will provide direct contract funding to TAMC for $71,616.60. The Collaborating Party shall provide funds for goods and services upon receipt of invoices. The Collaborating Party will remit checks to TAMC made payable to "Treasurer of the United States" within 30 days of receipt of invoices. Funds for expenses will be deposited in a distinct Department of the Army account under control of the Directorate of Resource Management, and managed by the Department of Clinical Investigation, TAMC.

d. **Paragraph E.17 is changed to read:**

E.17. Funds up to $47,188.00 will be available to cover research related travel costs to support data collection at remote research location and other study related travel costs. Fund reimbursement will be to TAMC via a check made payable to the "Treasurer of the United States" within 30 days of receipt of invoice. Funds for expenses will be deposited in a distinct Department of the Army account under control of the Directorate of Resource Management, and managed by the Department of Clinical Investigation, TAMC.

It previously read:

E.17. Funds up to $65,106.00 will be available to cover research related travel costs to support data collection at remote research location. Fund reimbursement will be to TAMC via a check made payable to the "Treasurer of the United States" within 30 days of receipt of invoice. Funds for expenses will be deposited in a distinct Department of the Army account under control of the Directorate of Resource Management, and managed by the Department of Clinical Investigation, TAMC.

2. Amendment #1 to the CRADA is necessary to document the no-cost extension increasing the time to complete the project, reallocation of travel funds to reflect changes in travel needs, and change in Payment Schedule dollar amount.

3. All other provisions of the CRADA #0811-T-C954 between the Parties continue in force and are unaffected by this Amendment.

4. By signing the document below, each Party understands and agrees to amendment #1 for CRADA #0811-T-C942 as proposed.

5. SIGNATORIES.

Clinical Investigation Regulatory Office (Federal Laboratory):

KLOTE.MARY.MCNERNEY.1030496210

DATE: 15 April 2010

Lieutenant Colonel Mary M. Klote, Medical Corps
Director, Clinical Investigation Regulatory Office
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IMMPACT
FINAL REPORT 2010

APPENDIX
A-2

48 Monthly eICU Coordinator Report – February 2010

48.1 US Naval Hospital Guam begins installation of new Philips Telemetry Server.

The US Naval Hospital in Guam will be upgrading their Philips telemetry server the week of 15 February. The new server will use IntelliVue with advanced features: Clinical decision support tools, including real-time trend display and retrospective review applications, Secure web access with multi-patient views, Scalable to support 4 to 3,840 patients with up to 96-hour Full Disclosure for review of physiologic data, HL7 data export to the IntelliVue Clinical Information Portfolio and other clinical information systems, Inbound ADT interface, Direct ECG export to cardiology management systems, Integrated paging controls, including waveform paging, Portal technology to access hospital applications such as PACS and LIS and Research data export

Operational Documentation

- Updated eCareManager with new clinical and medical provider information
- The Operational Record was updated

Coordinated Activity

- Coordinated eCareManager and eSearch training with TAMC, USNHG and 121CSH medical and clinical personnel
- Ms Elizabeth Watkins TAMC was provided updated eICU consultation data.
- Participated in a eSearch and Reporting Services training with:
  - Mr Russ Raynor from VISICU.
- Ms Nicole McPherson discussed eICU Coordination tasks and responsibilities with Steven Sellner. Mr Sellner has been contracted to continue in this role until January 2011.
- Ms Leslie New was contacted 2 February with a list of TAMC physicians actively using the eICU for consultations. Ms New will verify that all physicians on the list have privileges in both Guam and Korea.
- SGT Harris at Patient Admitting and Discharge (PAD) was contacted for assistance with Mini Registrations.
  - Dr Crawley had requested mini registrations for patients seen 20-21 February to capture work load credit.
  - Ms Traycee Haemmerle was contacted for assistance with CHCS training on mini registration procedures.

Operational Record

- Updated status of the following operational records
  - Clinical activity and census information from onset of eICU operations to the present
  - Technical support activity from onset of UH eICU involvement to present.

eICU Clinical Activity

- 121CSH Korea: During the month of February, no eICU consultations were completed at the 121st Combat Support Hospital in Korea.

- USNHG: During the month of February, 17 eICU consultations were completed at US Naval Hospital Guam.

Consult Date	Age	Dx	Ventilator Status	Days	Changes	Admitted ICU	Admitted Hosp	LOS ICU	LOS Hosp	Vasoactive Meds	Service Consult	Service Attending	Disposition
2/19/2010	70	Resp Failure	Intubated			2/17/2010	2/17/2010	2	2	NONE	CCM	IM	
2/19/2010	64	Aspiration PNA	Intubated			2/17/2010	2/17/2010	2	2	NONE	CCM	IM	
2/19/2010	71	AFIB RVR	Not Ventilated			2/17/2010	2/17/2010	2	2	NONE	CCM	IM	
2/19/2010	65	NSTEMI	Intubated			2/3/2010	2/3/2010	16	16	NONE	CCM	IM	
2/19/2010	78	MI w/ Multi-organ fail	Intubated			2/19/2010	2/19/2010	0	0	NONE	CCM	IM	
2/19/2010	62	NSTEMI	Intubated			2/18/2010	2/18/2010	1	1	NONE	CCM	IM	
2/20/2010	70	Resp Failure	Intubated			2/17/2010	2/17/2010	3	3	NONE	CCM	IM	
2/20/2010	64	Aspiration PNA	Intubated			2/17/2010	2/17/2010	3	3	NONE	CCM	IM	
2/20/2010	71	AFIB RVR	Not Ventilated			2/17/2010	2/17/2010	3	3	NONE	CCM	IM	
2/20/2010	65	NSTEMI	Intubated			2/3/2010	2/3/2010	17	17	NONE	CCM	IM	
2/20/2010	78	MI w/ Multi-organ fail	Intubated			2/19/2010	2/19/2010	1	1	NONE	CCM	IM	
2/21/2010	62	NSTEMI	Not Ventilated			2/18/2010	2/18/2010	3	3	NONE	CCM	IM	
2/21/2010	70	Resp Failure	Intubated			2/17/2010	2/17/2010	4	4	NONE	CCM	IM	
2/21/2010	64	Aspiration PNA	Intubated			2/17/2010	2/17/2010	4	4	NONE	CCM	IM	
2/21/2010	71	AFIB RVR	Not Ventilated			2/17/2010	2/17/2010	4	4	NONE	CCM	IM	
2/21/2010	65	NSTEMI	Intubated			2/3/2010	2/3/2010	18	18	NONE	CCM	IM	
2/21/2010	62	NSTEMI	Not Ventilated			2/18/2010	2/18/2010	3	3	NONE	CCM	IM	

Dailey Census:

- 121 Combat Support Hospital Korea
  - Unavailable due to loss of CHCS connectivity from Korea

- US Naval Hospital Guam
  - Unavailable due to loss of CHCS connectivity from Korea

Clinical Operations:

- Our Clinical Liaison, Ms Laurie Kalleberg was transferred to West Virginia in October 2009. Her eICU Liaison duties at 121CSH Korea will be assumed by Ms Miran Kim and CPT Alecia Williams.
- Coordinated eICU critical care support for USNHG with Dr. Crawley at TAMC and Dr. Tripp at USNHG. Tripler critical care specialists, Dr Crawley and Dr. Edwards provided daily eICU consultations for the USNHG ICU from 19 February to 21 February while Dr. Tripp was on leave.
- Instructed CPT Williams at 121CSH on a new convention for entry of patient ID information into eCareManager. The new convention uses the following format:
  - FMP-CHCS# for registering new patients in the application.

Technical Activity:

- Mr Padgett is the new TIMPO representative for 121CSH Korea, he replaced Tim Butterworth. Mr Padgett was updated with technical specifications on how the CISCO 2800 router uses a DISA circuit funded by TIMPO. He indicated that he would be available to assist with a router IOS upgrade for use with encryption.
- Provided Mr. Terence McCartney and Ron Carreira of Philips with networking support as part of a server upgrade for USNHG. Mr McCartney will be installing a new Philips server in Guam the week of 15 February. As part of the upgrade, a new Philips client was configured for use in the eICU. Mr McCartney will configure the work station in Guam and then ship it to Tripler for installation. A temporary Philips client was installed in the eICU during the upgrade for use until the new work station arrives.
- As part of the equipment upgrade, a temporary Philips client was installed in the eICU for use until the new work station arrives.
- .
  - Trouble shot and reconfigured Guam and Tripler CISCO router configurations; new configurations were reviewed with Mr McCartney who was on-site in Guam.

  - Reviewed IP protocols with Mr McCartney of Philips for continuity. We have been given a list of available IP address to use with our routers. Mr McCartney was provided an IP address and Socket for the transmission of HL7 data (IP 10.10.1.27, Port 8000).
  - Provided Philips technicians with VISICU Vital Signs Inbound Interface Specifications for HL7, eICU socket parameters and selected router IP address.
- Both TAMC work stations in the eICU were replaced after one of them failed. Data from the old work stations was successfully transferred to the new ones.
  - One new work station was configured to use CHCS and MedWeb from both Guam and Korea.

Credentialing Status:

The following TAMC physicians are credentialed at 121CSH and USNHG.

LTC Eric A. Crawley
MAJ Don Helman – Critical Care
Dr. Anjali Subbaswamy – Pediatric Critical Care Specialist
Dr. Angela Hsu - Pediatric Critical Care Specialist
CDR Illovsky – Cardiology
MAJ Sean Dooley – CCM, TAMC
MAJ Marc Hunt – Cardiology
Dr Benjamin Berg – UH School of Medicine
LCDR Konrad Davis – CCM

The following TAMC physician need to re-submit their request for privileges or are awaiting approval

LTC Kurt Edwards - CCM

Training: The following 121CSH and USNHG Medical personnel completed eICU training

Research Activity – None.

Innovative Ideas – None to report

Significant Deliverables this period

Monthly report for February 2010 as part of the operational record
Updated eICU Operational Manual

Cost/Price Reporting

Total Cost/Price of Contract (including all modifications):	
Cost Expended During This Reporting Period:	
Cost/Price Expended to Date:	
Cost/Price Remaining:	

Will Cost/Price remaining cover task activities as scheduled through the end of the POP?

1. Yes X
2. No___ Explain and give rationale/proposed risk mitigation

Does Cost/Price exceed that required through end of the POP?

3. No X
4. Yes __ Explain and give rationale/proposed risk mitigation

49 Monthly eICU Coordinator Report – March 2010

49.1 LunarLine completes DIACAP feasibility report: VISICU "No Short Term Plan".

On Thursday, 01 April there was a teleconference with VISICU and University of Hawaii personnel to discuss the results of the DIACAP assessment completed by LunarLine. Steve Park, Michael Shay, and Dan Watterson represented VISICU and Dr. Berg represented UH. The discussion focused on the "big picture" and the "level of effort" required complying with the DIACAP requirements. Mr Shay, a software engineer for VISICU was the principal spokesperson for VISICU. Mr Shay indicated that Phillips/VISICU did not have a short term plan for completing a DIACAP certification as most of their business comes from the commercial sector. He added that Phillips has a rigorous certification process which obviously is not aligned with that of the DoD. As for the level of effort required to complete the DIACAP, Mr Shay mentioned that it would take several release cycles (years) and substantial resources (millions of $) to complete the process.

Operational Documentation

- Updated eCareManager with new clinical and medical provider information
- The Operational Record was updated

Coordinated Activity

- On 01 March, a meeting was held to review current Telehealth projects hosted by Pacific Regional Medical Command (PrMC). The meeting included:
  - Dr Ray Folen – use of VTC for remote Bio Feedback
  - George Hasky
  - Dr Chad Grills – Neuropsychology
  - John E. Meyers
  - Dr. Eric Crawley – eICU Remote Access to Critical Care
  - Steven Sellner, RN – eICU Coordinator
- Ms Elizabeth Watkins TAMC was provided updated eICU consultation data and charts of on military funding pathways.
- Ms Janet Clack visited the eICU to review eICU highlights for a proposed tri-fold eICU brochure.
- Dr Eric Crawley discussed eICU Coordination tasks and responsibilities with Steven Sellner. Mr Sellner has been contracted to continue in this role until January 2011.
- Ms Leslie New was contacted 2 February with a list of TAMC physicians actively using the eICU for consultations. Ms New will verify that all physicians on the list have privileges in both Guam and Korea.
- SGT Harris at Patient Admitting and Discharge (PAD) was contacted for assistance with Mini Registrations.
  - Dr Crawley had requested mini registrations for patients seen 20-21 February to capture work load credit.
  - Ms Traycee Haemmerle was contacted for assistance with CHCS training on mini registration procedures.
  - Submitted a list of eight patients in Guam to SGT Harris. SGT Harris used the enrollment information to "walk in" Critical Care consultations in the CHCS system.
- Jeanne DeCosta from the CHCS helpdesk visited the eICU on 11 March. Ms DeCosta reviewed the eICU process and provided a check list for "walking in" eICU into CHCS.

    - Ms DeCosta's check list was reviewed with: Dr Christopher Mahnke, Dr Crawley and Nicole McPherson
- On 15 March, Dr Mahnke demonstrated the "Pacific Asynchronous Telehealth Teleconsultation System (PATH). PATH provides an alternative means to schedule eICU consults and enroll patients into CHCS.
- On 18 March, Ms Lorna Takaki visited the eICU. Ms Takaki examined our eICU paper records and storage procedures. She recommended that the older records be scanned to a CD ROM so they could be removed.
- On 25 March we visited Ms Brenda Horner in Managed Care to see if eICU consults entered into CHCS could be reimbursed.
    - A list of previously "walked in" patients was provided.

VIP Visits

- On 5 March, Mr Shero and Dr. Colleen Rye visited the eICU. Dr. Rye is the new Director of Telehealth in the Army office of the Surgeon General. Dr Rye met with Dr Davis and was provided a copy of the eICU Operational Manual.

Operational Record

- Updated status of the following operational records
- Clinical activity and census information from onset of eICU operations to the present
- Technical support activity from onset of UH eICU involvement to present.

eICU Clinical Activity

121CSH Korea: During the month of March, no eICU consultations were completed at the 121st Combat Support Hospital in Korea.

USNHG: During the month of March, no eICU consultations were completed at US Naval Hospital Guam.

Dailey Census:

121 Combat Support Hospital Korea

Date	Age	Dx	Ventilator Status
3/1/2010	26	Laryngitis	Not Intubated
3/2/2010	50	Chest Pain	Not Intubated
3/2/2010	2	PNA	Not Intubated
3/3/2010	2	PNA	Not Intubated
3/4/2010	2	PNA	Not Intubated
3/5/2010	2	PNA	Not Intubated
3/8/2010	89	SOB	Not Intubated
3/8/2010	39	Gastric Bipass	Not Intubated
3/8/2010	2	Overdose	Not Intubated
3/24/2010	0.1	Apnea	Not Intubated
3/24/2010	40	dyspnea	Not Intubated
3/26/2010	64	CP	Not Intubated
3/29/2010	35	Gastric Bipass	Not Intubated
3/29/2010	20	Tachycardia/seizures	Not Intubated
3/30/2010	35	Gastric Bipass	Not Intubated
3/30/2010	64	Chest Pain	Not Intubated
3/31/2010	35	Gastric Bipass	Not Intubated
3/31/2010	64	Chest Pain	Not Intubated

US Naval Hospital Guam

Date	Age	Dx	Ventilator Status
3/1/2010	74	NSTEMI	Intubated
3/1/2010	64	Aspiration PNA	Intubated
3/1/2010	71	Septic Shock	Intubated
3/1/2010	65	NSTEMI	Trach
3/1/2010	53	Resp Failure	Intubated
3/2/2010	74	NSTEMI	Intubated
3/2/2010	59	CVA	Not Ventilated
3/2/2010	64	Aspiration PNA	Intubated
3/2/2010	71	Septic Shock	Intubated
3/2/2010	4	ETOH Poisoning	Not Ventilated
3/2/2010	53	Resp Failure	Intubated
3/3/2010	74	NSTEMI	Intubated
3/3/2010	59	CVA	Not Ventilated
3/3/2010	64	Aspiration PNA	Intubated
3/3/2010	71	Septic Shock	Intubated
3/3/2010	4	ETOH Poisoning	Not Ventilated
3/3/2010	53	Resp Failure	Intubated
3/4/2010	74	NSTEMI	Intubated
3/4/2010	64	Aspiration PNA	Intubated
3/4/2010	71	Septic Shock	Intubated
3/4/2010	59	Open Coli	Intubated
3/4/2010	95	LGIB	Not Ventilated
3/5/2010	74	NSTEMI	Intubated
3/5/2010	71	Septic Shock	Intubated
3/5/2010	59	Open Coli	Intubated
3/5/2010	95	LGIB	Intubated
3/8/2010	54	Resp Failure	Intubated
3/8/2010	92	Resp Failure	Intubated
3/8/2010	74	NSTEMI	BiPAP
3/8/2010	71	Septic Shock	Intubated
3/8/2010	59	Open Coli	Intubated
3/8/2010	95	LGIB	Intubated
3/9/2010	92	Resp Failure	Intubated
3/9/2010	74	NSTEMI	BiPAP
3/9/2010	71	Septic Shock	Intubated
3/9/2010	59	Open Coli	Intubated
3/9/2010	95	LGIB	Intubated
3/9/2010	74	NSTEMI	Not Ventilated
3/10/2010	66	LGIB	Not Ventilated
3/10/2010	92	Resp Failure	Intubated
3/10/2010	74	NSTEMI	BiPAP
3/10/2010	54	Resp Failure	Intubated
3/10/2010	59	Open Coli	Intubated
3/10/2010	95	LGIB	Intubated
3/11/2010	95	LGIB	Intubated
3/11/2010	54	Resp Failure	Intubated
3/11/2010	74	NSTEMI	BiPAP
3/11/2010	25		Not Ventilated
3/12/2010	74	NSTEMI	BiPAP
3/12/2010	54	Resp Failure	Intubated
3/12/2010	75	PNA	Not Ventilated
3/12/2010	95	LGIB	Intubated
3/15/2010	66	NSTEMI	Not Ventilated
3/15/2010	62	Sepsis	Not Ventilated
3/15/2010	49	UGIB	Not Ventilated
3/15/2010	75	PNA	Not Ventilated
3/15/2010	95	LGIB	Intubated
3/16/2010	66	NSTEMI	Not Ventilated
3/16/2010	49	UGIB	Not Ventilated
3/16/2010	75	PNA	Not Ventilated
3/16/2010	95	LGIB	Intubated
3/17/2010	62	Gastric Ulcer	Not Ventilated
3/17/2010	89	Septic Shock	Intubated
3/17/2010	20	Sepsis	Not Ventilated
3/17/2010	49	UGIB	Not Ventilated
3/17/2010	75	PNA	Not Ventilated
3/17/2010	95	LGIB	Not Ventilated
3/18/2010	53	STEMI	Not Ventilated
3/18/2010	89	Septic Shock	Intubated
3/18/2010	20	Sepsis	Not Ventilated
3/18/2010	74	Hypotension	Intubated
3/18/2010	75	PNA	Not Ventilated
3/18/2010	95	LGIB	Not Ventilated
3/19/2010	81	Pericardial Effusion	Not Ventilated
3/19/2010	89	Septic Shock	Intubated
3/19/2010	53	STEMI	Not Ventilated
3/19/2010	74	Hypotension	Intubated
3/19/2010	75	PNA	Not Ventilated
3/22/2010	65	Sepsis	Intubated
3/22/2010	74	Hypotension	Intubated
3/22/2010	81	Pericardial Effusion	Trach
3/23/2010	65	Sepsis	Intubated
3/23/2010	74	Hypotension	Intubated
3/23/2010	81	Pericardial Effusion	Trach
3/24/2010	65	Sepsis	Intubated
3/24/2010	74	Hypotension	Intubated
3/24/2010	81	Pericardial Effusion	Trach
3/24/2010	64	Resp Failure	Intubated
3/25/2010	65	Sepsis	Intubated
3/25/2010	74	Hypotension	Intubated
3/25/2010	81	Pericardial Effusion	Trach
3/25/2010	64	Resp Failure	Intubated
3/26/2010	64	Resp Failure	Intubated
3/26/2010	65	Sepsis	Intubated
3/26/2010	74	Hypotension	Intubated
3/29/2010	12	Seizures	Not Ventilated
3/29/2010	74	Hypotension	Intubated
3/29/2010	92	Atrial Fib	Not Ventilated
3/29/2010	64	Resp Failure	Intubated
3/30/2010	64	Resp Failure	Intubated
3/30/2010	70	LGIB	Not Ventilated
3/31/2010	65	Sepsis	Intubated
3/31/2010	64	Resp Failure	Intubated

Clinical Operations:

- Our Clinical Liaison, Ms Laurie Kalleberg was transferred to West Virginia in October 2009. Her eICU Liaison duties at 121CSH Korea will be assumed by Ms Miran Kim and CPT Alecia Williams.
- Coordinated eICU critical care support for USNHG with Dr. Crawley at TAMC and Dr. Tripp at USNHG. Tripler critical care specialists, Dr Crawley and Dr. Edwards provided daily eICU consultations for the USNHG ICU from 19 February to 21 February while Dr. Tripp was on leave.
- Instructed CPT Williams at 121CSH on a new convention for entry of patient ID information into eCareManager. The new convention uses the following format:
- FMP-CHCS# for registering new patients in the application.

Technical Activity:

- Mr Padgett is the new TIMPO representative for 121CSH Korea, he replaced Tim Butterworth. Mr Padgett was updated with technical specifications on how the CISCO 2800 router uses a DISA circuit funded by TIMPO. He indicated that he would be available to assist with a router IOS upgrade for use with encryption.
    - Mr Padgett was given the TAMC router's (2650) IOS version to ensure compatibility
- A Fire Wall Waiver Form was completed for access to 121CSH Korea and USNHG's remote CHCS and MedWeb application. The form was submitted to LCDR Judith Dickert, Department of Medicine Chief and Mr Hiram Wong In IMD for approval.
- From 21-22 March the power in the 3D computer room was turned off for a power upgrade.
- Dr John Kim at 121CSH and Dr Michael Tripp at USNHG were notified that eICU consultation would not be available during this time period.
- The eICU servers and NAS were systematically shut down on 21 March and restarted on 22 March. The 3.6 eCareManager administration guide was used to ensure the proper shutdown and restart procedures were followed.
- On 8 March, PDF Converter Pro was installed on the new TAMC workstation. This software application is required for eICU documentation.
- On 15 March:
    - The IMD Help desk and Theresa Bowser was contacted for assistance with setting up and accessing a network drive in the Pulmonary Medicine Department. The remote drive is needed to backup eICU files and documentation.
    - Software CEEP for MS Visio software was submitted to Ms Nicole McPherson.
- On 16 March, a draft Memorandum of Understanding (MOU) was submitted to Ms Jerri Mansapit at USNHG. She forwarded the document to Mr Benjamin Taitano for review.
- On 19 March, two TAMC workstations (ecn#0h9478 and ecn#033360) were turned into SGT Tanya Pindell, the hand receipt holder in the department of Medicine.
- On 22 March LTC Donna Beed was provided a copy of LunarLines DIACAP feasibility assessment.
- On 26 March a request for "full access" to the Philips telemetry at USNHG was emailed to LCDR Reichert
- On 29 March, Mr Joel Tanaka requested verification that VISICU's eICU application is FDA approved. Mr Kim Rosenbaum of VISICU was contacted and he provided the original FDA registration and approval letters.
    - The relationship between the Argus "Careview" application and VISICU's eCareManager was also clarified

Credentialing Status:
The following TAMC physicians are credentialed at 121CSH and USNHG.

LTC Eric A. Crawley
MAJ Don Helman – Critical Care
Dr. Anjali Subbaswamy – Pediatric Critical Care Specialist
Dr. Angela Hsu - Pediatric Critical Care Specialist
CDR Illovsky – Cardiology
MAJ Sean Dooley – CCM, TAMC
MAJ Marc Hunt – Cardiology
Dr Benjamin Berg – UH School of Medicine
LCDR Konrad Davis – CCM

The following TAMC physician need to re-submit their request for privileges or are awaiting approval

LTC Kurt Edwards - CCM

Training

- A list of 121CSH Nurses was submitted to Ms Linda Rettig at VISICU.

Training: The following 121CSH and USNHG Medical personnel completed eICU training

Research Activity – None.

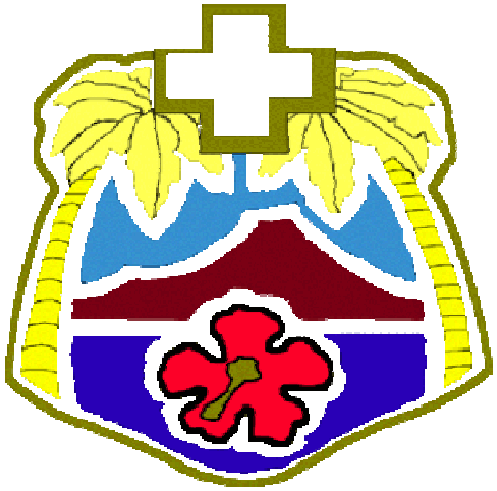
Innovative Ideas – None to report

Significant Deliverables this period

- Monthly report for March 2010 as part of the operational record
- Updated eICU Operational Manual

IMMPACT
FINAL REPORT 2010

APPENDIX
A-3



Electronic Intensive Care

Projects

Operations Manual

Tripler Army Medical Center

Wing 6H Room 701,

1 Jarrett White Road,

Tripler AMC, HI 96859-5000

1 Introduction

1.1 "We have the expertise and the capacity to participate in the care of those patients, and I think this system is a great way of projecting that expertise to those smaller facilities," Dr. Benjamin Berg, COL (RTD) Tripler's Director of the eICU program

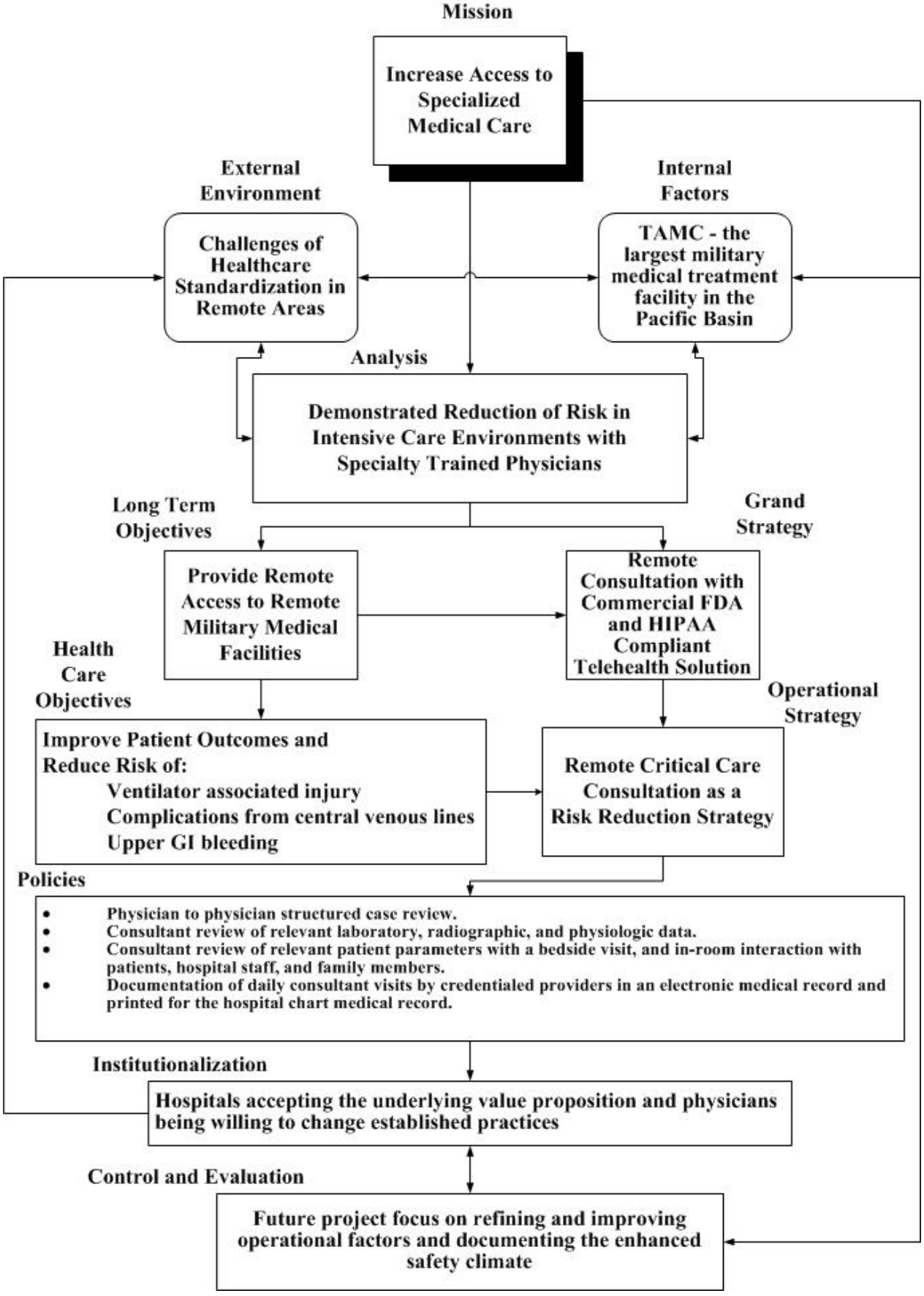
In the spring of 2001, then COL Benjamin Berg, a board certified Pulmonology Specialist at Tripler Army Medical Center (TAMC), had recognized the importance of Intensive Care Specialist (Intensivist) involvement on inpatient intensive care units (ICU). At that time, current literature had identified factors that were related to improved outcomes as measured by reduced mortality, improved efficiency, decreased length of stay, or decreased cost of care. These factors included direct management of ICU patients by an Intensivist. Unfortunately there were not enough Intensivists available and remote Department of Defense medical facilities were too isolated and too small to justify staffing by full time medical, clinical and pharmacy specialists. In response to this challenge, Dr. Berg sought to supplement the care of ICU patients in these remote locations using telehealth technologies for access to available specialists at TAMC. The Pacific Telehealth and Technology Hui (HUI), a joint venture between the Department of Defense and the Veteran's Administration decided to fund the project and the Department of Defense Electronic Intensive Care Program (eICU) was born.

1.1.1 The Purpose of eICU Program is to Demonstrate the Applicability of Advanced Digital Medicine Techniques to Military Medicine

The eICU operational strategy - This document serves as both an electronic intensive care unit (eICU) Operational Manual and Evaluation Report of the Tripler Army Medical Center Electronic Intensive Care Unit (eICU) program. The eICU program was conceived in response to a need for access to Medical Specialists in remote Department of Defense (DoD) health care facilities. This program is composed of three distinct projects: 1) Remote Access to Medical Specialists – Critical Care (RAMS-CC), 2) Remote Critical Care Consultation: eICU "Turn On/Turn Off" (ToTo) Technology Assessment and 3) ICU Multipoint Military Pacific Consultation using Telehealth (IMMPACT).

The vision of the eICU program is: "to reduce risk and improve outcomes for patients located at remote DoD health care facilities, by providing access to specialized medical care." Critical care services and resources are mismatched in the United States and in the military health care system. Inadequate numbers of specialty trained and board certified critical care physicians are available to provide specialist participation in the care of all critically ill patients (Ewart, 2004)[1]. Within the Department of Defense critical care physician specialists (Intensivists) are unavailable to provide direct care for patients at non-medical Center (MEDCEN) military treatment facilities (MTF). This is due to the severe shortage of board certified critical care specialists in the Military Health System (MHS), and nationwide. It has been well documented that intensive care units have improved clinical outcomes, increased patient safety, and more efficient resource utilization when specialists participate in the care of their patients. The eICU operational strategy was to utilize a telehealth solution to provide access to Intensivists located at large medical centers, resulting in improved patient outcomes and reduced risk of ICU related complications.

Fig 1.1.1 eICU Strategic Plan



The objective of the RAMS-CC project was to build the infrastructure for the acquisition, transmission and remote monitoring of real-time ICU patient data. The purpose of this proof-of-concept project was to demonstrate the applicability of advanced digital technology, such as an eICU, to military medicine. RAMS-CC was a demonstration project funded and managed by the Pacific Telehealth and Technology Hui (Hui) in collaboration with Tripler Army Medical Center (TAMC) and the U. S. Naval Hospital Guam (NHG). Through the application of telecommunications technology and a combination of software and hardware, an electronically monitored intensive care unit (electronic ICU) provided intensive care specialists (Intensivists) access to remote patients' conditions from a central location. This enabled the Intensivists to communicate care instructions to healthcare practitioners operating in remote areas where the patients are located. At the start of the project, the Hui conducted a review of commercial-off-the-shelf (COTS) products for digital acquisition and remote analysis of real-time ICU patient data. Following this review, the Hui selected the eICU® solution, an FDA-approved electronic ICU developed by VISICU Systems of Baltimore, Maryland. In May 2003, the Hui installed the connectivity equipment at the U.S. Naval Hospital Guam and linked it to the central system at TAMC in Honolulu in June 2003. The operational phase of the project ran through September 2004. During that time, the Hui oversaw efforts to integrate the system with the DoD's network infrastructure and secure additional long-term, operational funding.

Currently VISICU's eICU system relies on always-on dedicated data circuits between the centralized eICU center and remote ICUs. The ToTo project commissioned VISICU to explore the technical feasibility (connectivity, bandwidth constraints, security, quality of service, etc.) of using alternate forms of connectivity (turn-on-turn-off methodologies such as Satellite, ISDN telephone and non-dedicated Internet protocol) between eICU centers and ICUs. Due to high latency, the use of Satellite technology was not feasible, and the main focus of the study switched to ISDN and Web VPN technologies. The main purpose of the study was then to determine whether ISDN PRI and WEB VPN is possible with current hardware, whether additional hardware/ network components are required, whether FDA and/or HIPAA compliance is affected, and whether any system functionality is affected by turn-on-turn-off forms of connectivity. The feasibility of using centralized server stack and remote server stacks was also explored. In May 2006, Field Tests were conducted to determine which of the technical alternatives was practical for future deployment. As a result of the TOTO Project investigation, VISICU concluded that Web VPN technology offered acceptable performance at a significantly reduced cost. Test results showed a slight cost advantage for ISDN PRI over a dedicated leased line based on monthly eICU usage of less than 270 minutes. VISICU then recommended that future eICU installations be based on a distributed network system using Web VPN and thin client technologies.

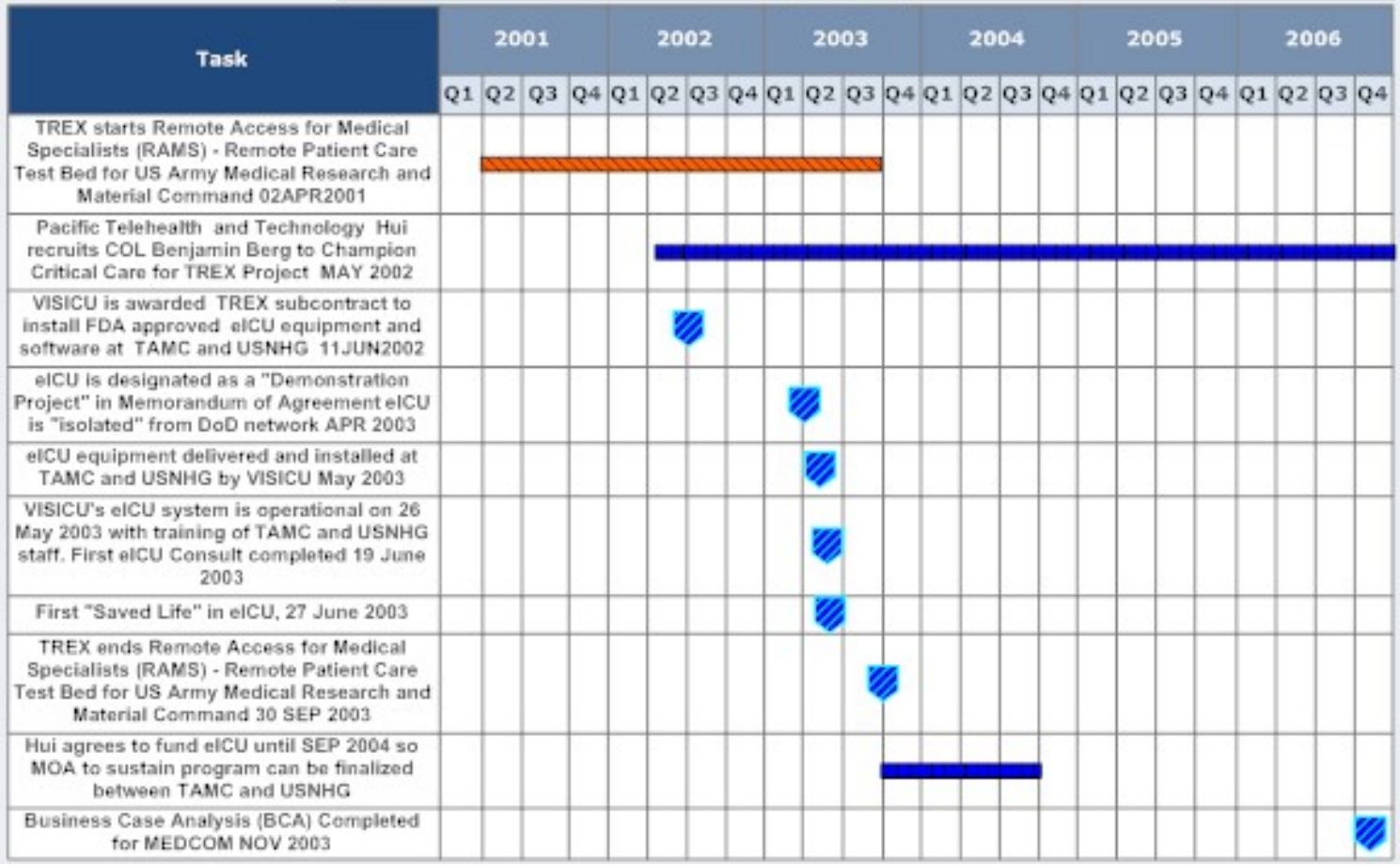
Remote critical care consultation has been provided from Hawaii to Guam since 2003. In April of 2007, the 121st Combat Support Hospital (121CSH) in Seoul, South Korea was added to the DoD eICU network. This care model has improved outcomes (Breslow MJ, 2004)[2], and has become a standard of care at over 133 hospitals in the USA. Team training in medicine is measurable using mannequin/human patient simulators (Blum RH, 2005[3] and Holcomb JB, 2002[4]), and effective remote team training has been described (Treloar D, 2001). It is unclear if medical team training performance metrics are maintained when one or more members of a specifically trained care-team participate remotely. The IMMPACT study seeks to examine mannequin-based team training performance in two DoD locations who utilize remote real-time critical care consultation. The project proposes that on-site team training performance metrics will be maintained when one team member participates in simulation based clinical scenarios from a remote location. The main focus of the project is to describe the correlation between on-site team performance characteristics and team performance characteristic when a physician team member participates remotely, via a familiar telehealth system. On-site multidisciplinary clinical team training will be conducted and assessed at two study sites where remote critical care consultation is utilized.

Physician team members will then participate in scenario based team performance assessments from a remote location. We will measure correlation between team performance metrics with on-site, and with off-site physician participants. The performance characteristics of multidisciplinary critical care teams with remote and on-site participants will inform clinical workflow structure for future electronic ICU services. Propagation of specifically trained care teams, utilizing remotely located key participants requires demonstration of effective and reliable operational characteristics. Effective remote critical care consultation will allow forward deployed military medical units to access specialist care.

Figure 1.1.2 eICU Project Timelines

eICU Development

Key Dates			
4/2/2001	RAMS-CC Initiated	12/1/2006	eICU assists TF of Guam Sailors after boiler explosion
5/1/2002	Dr. Berg Champions eICU Project	4/27/2007	121 Combat Support Hospital Korea On-line
6/11/2002	VISICU Equipment Installed	7/7/2007	1st 121CSH eICU consult completed
6/19/2003	1st eICU Consult		
6/27/2003	1st Life Saved in eICU		
9/30/2003	RAMS-CC Completed		

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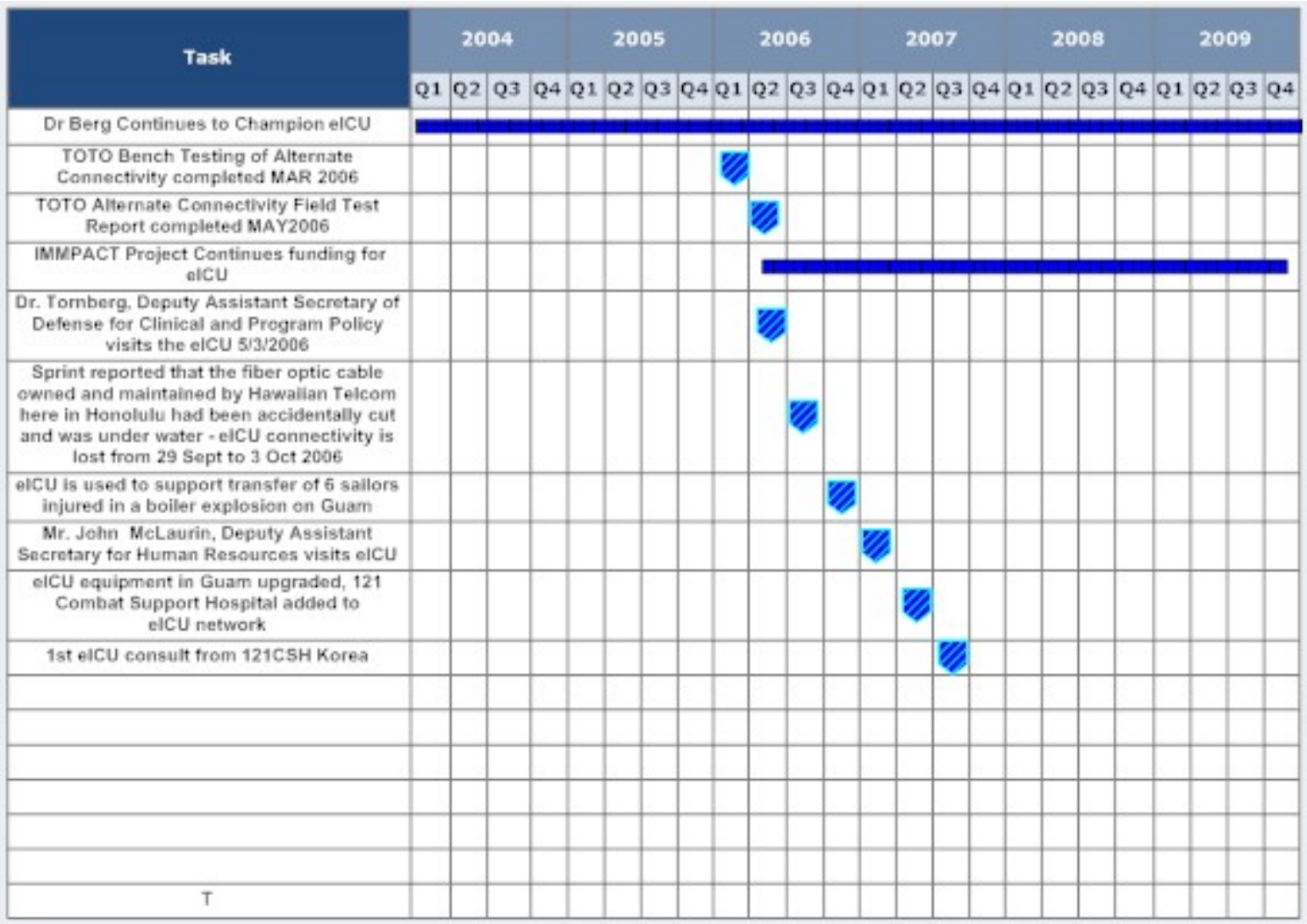
2005
2006
2007
2008
2009
Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4
Dr Berg Continues to Champion eICU
Sustainment MOA Completed but not signed by USNHG DEC 2003
LTG James Peake, US Army Surgeon General and MEDCOM Commander visits eICU DEC 2003
Venture Capital Initiative to fund eICU JAN 2004
Expansion of eICU to 121st Combat Support Hospital, Korea, proposed FEB 2004
VADM Michael Cowan, Surgeon General of the Navy visits eICU MAR 2004
GEN George W. Casey,Vice Chief of Staff for the United States Army visits eICU MAR 2004
BCA for Venture Capital submitted to PIC APR 2004
Transfer of remaining Walter Reed Army Medical Center funding for VISICU to TAMC is proposed to sustain eICU JUN 2004
Hui decides to continue funding for eICU until MAR 2005 JUL 2004
eICU Coordinator Services end due to lapse in funding APR 2005
TOTO Funding for eICU
ICU Multipoint Military Pacific Consultation Using Telehealth (IMMPACT) initiated JUL 2005
IMMPACT support letter from TAMC, 121 and USNHG received SEP 2005
Electronic ICU (eICU) Turn-on/Turn-off Technology Validation [TOTO] protocol completed OCT 2005
TOTO Alternative Connectivity Technical Appraisal Report completed NOV 2005
TOTO research protocol approved FEB 2006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Dr Berg Continues to Champion eICU
TOTO Bench Testing of Alternate Connectivity completed MAR 2006
TOTO Alternate Connectivity Field Test Report completed MAY2006
IMMPACT Project Continues funding for eICU
Dr. Tornberg, Deputy Assistant Secretary of Defense for Clinical and Program Policy visits the eICU 5/3/2006
Sprint reported that the fiber optic cable owned and maintained by Hawaiian Telcom here in Honolulu had been accidentally cut and was under water - eICU connectivity is lost from 29 Sept to 3 Oct 2006
eICU is used to support transfer of 6 sailors injured in a boiler explosion on Guam
Mr. John McLaurin, Deputy Assistant Secretary for Human Resources visits eICU
eICU equipment in Guam upgraded, 121 Combat Support Hospital added to eICU network
1st eICU consult from 121CSH Korea
T

2 Program Development and Funding

2.1 The Pacific Telehealth and Technology Hui provided a framework for the physical and clinical implementation for Tripler Army Medical Center's eICU Program

In April 2001, the Pacific Telehealth and Technology Hui (HUI) was designated the Contracting Officer's Technical Representative (COTR) for a project called "Remote Access to Medical Specialists – Remote Patient Care Monitoring Test Bed. (RAMS)" Later that year, then COL Benjamin Berg, approached the HUI with his idea for an Electronic Intensive Care Unit between TAMC and US Naval Hospital Guam (USNHG). The HUI was able to work with Trex Enterprises, the prime contractor for RAMS to include a second project, "Remote Access for Medical Specialists – Critical Care."

2.1.1 The Pacific Telehealth and Technology Hui

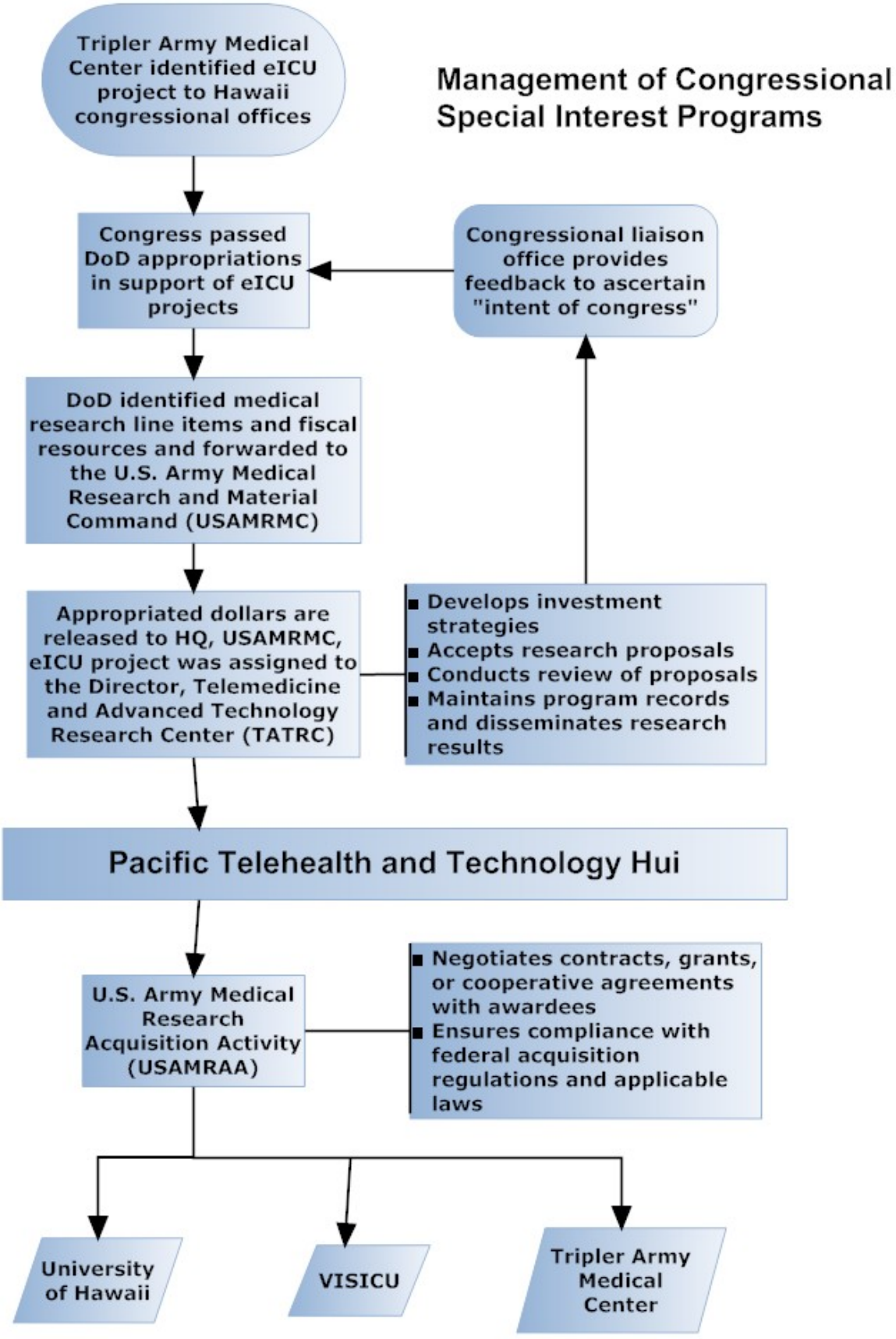
In December 1999, a Memorandum of Understanding (MOU) was executed between the U.S. Army's Pacific Regional Medical Command, Tripler Army Medical Center (TAMC) and the Veterans Affairs Medical and Regional Office Center, Honolulu (VAMROC Honolulu) to establish a partnership, the Pacific Telehealth and Technology Hui (the Hui). The Hui's purpose is to leverage their mutual strengths and resources to improve the quality, accessibility, patient satisfaction, and cost-effectiveness of healthcare services provided to beneficiaries through the use of emerging and existing telehealth technologies. The growth of information and communications technologies during the past decade has broadened the Hui's outreach globally in establishing interdisciplinary collaborations for government-funded research projects with universities and industry. As a collaborator and facilitator of research partnerships, the Hui has assumed new leadership as a subsidiary of Telemedicine and Advanced Technology Research Center (TATRC) under the U.S. Army Medical Research and Materiel Command (USAMRMC).

The Hui's RAMS-CC project utilized prime contractor TREX Enterprises of Maui, Hawaii for selection of an eICU monitoring system. In May 2002, VISICU Corporation of Baltimore, Maryland was sub-contracted to design build and install their proprietary eICU monitoring system, which provides capability for monitoring six intensive care beds at USNHG from an eICU at TAMC. The system went live on June 9, 2003, and the Hui continued to fund operations until 30 March 2005.

In August 2005, USAMRMC provided access to left over funding from a similar eICU project at Walter Reed Army Medical Center. This was used to fund the ToTo project until May 2006 when IMMPACT funding became available. The IMMPACT project provided funding to expand the eICU system to 121 Combat Support Hospital Korea (121CSH) in April 2007.

TAMC's Department of Medicine (DoM) provides medical, clinical and pharmacy support for the eICU and provides remote consultation according to process, procedures, and protocols developed in this Operational Manual. The services provided by TAMC, USNHG and 121CSH Korea is consultative only and it is not anticipated that TAMC will provide active management of USNHG or 121CSH ICU patients. The users of this system recognize potential in the eICU system and wish to participate in implementation and operation of the eICU system, as well as determine whether to continue operation of the eICU system after congressional funding for the project terminates.

Figure 2.1.1 Government Funding Pathways



3 The Opportunity

3.1 By providing remote hospital intensive care units with access to medical specialists, the eICU Program can improve outcomes and reduce risk of injury

Using high-resolution remote controlled cameras and real-time transmissions of patient telemetry, Tripler specialists can examine intensive care unit patients, talk to them, and review heart rate, blood pressure and X-rays on a bank of computer monitors to assist physicians in remote locations

Our Clinical Strategy:

A system manager at TAMC (clinical nurse) identifies all patients who are scheduled for consultation, based upon provider request. Current clinical laboratory data is remotely accessed from USNHG AND 121CSH hospital information systems, and clinical notes reviewed. The system manager, through pre-session preparation and concurrent technical assistance, facilitates physician consultation. Physicians and nurses underwent several hours of individualized training. Consultation sessions are comprised of 4 distinct components:

- Physician to physician structured case review.
- Consultant review of relevant laboratory, radiographic, and physiologic data.
- Consultant review of relevant patient parameters with a bedside visit, and in-room interaction with patients, hospital staff, and family members.
- Documentation of daily consultant visits by credentialed providers in an electronic medical record and printed for the hospital chart medical record.

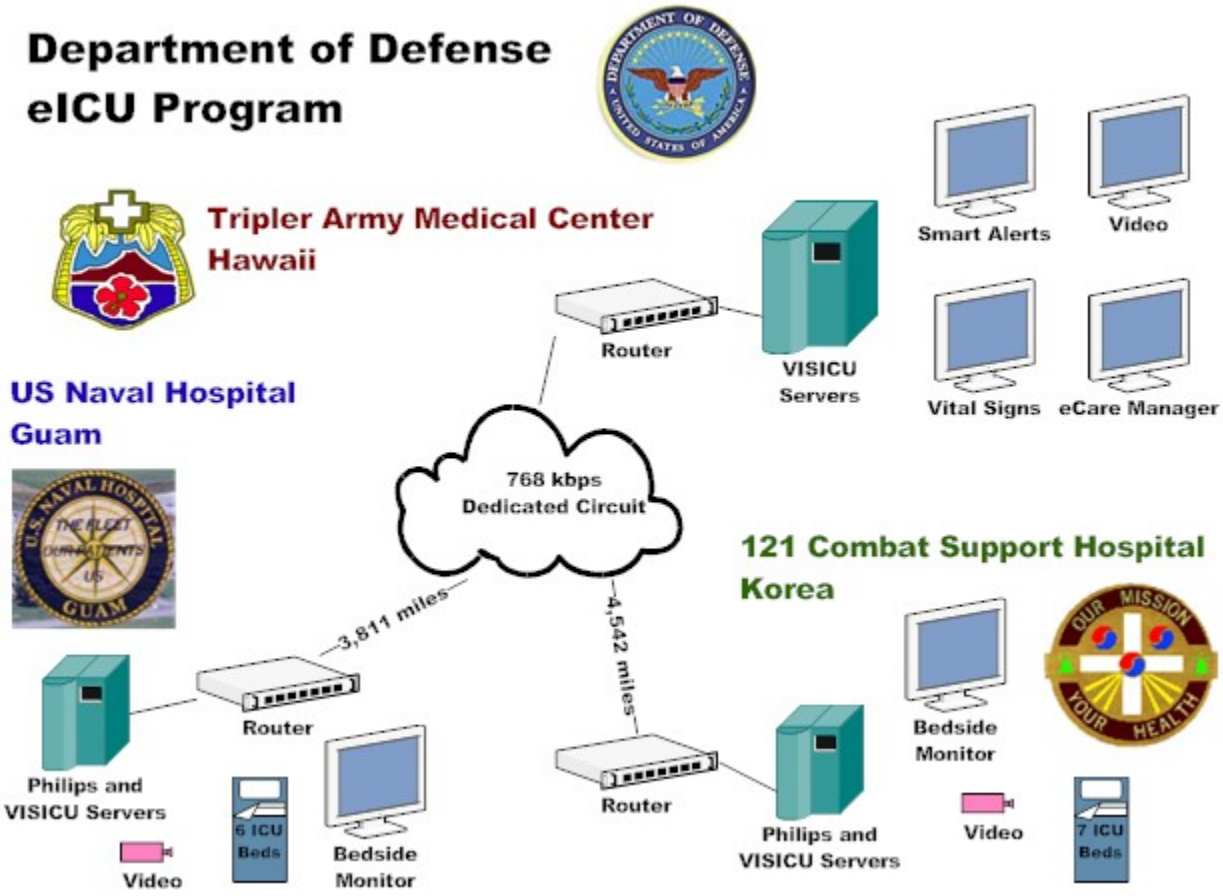
Our Clinical Objective:

A fundamental objective for all intensive care environments is to minimize risk and unintended consequences. Active risk minimization is a critical foundation for tipping the scales in favor of enhanced clinical outcomes for critically ill patients. Risk minimization strategies in the care of critically ill patients are demonstrated to be effective. Examples include the evolution of ventilator management strategies in patients with Acute Respiratory Distress Syndrome, (ARDS). Low volume ventilation minimizes the risk of ventilator associated lung injury[16]. Strategies to minimize the risk of complications from central venous line placement[17], and effective focused use of prophylaxis for upper GI bleeding [18] are other examples. Risk minimization in ICU's through staffing of intensive care environments with specialty-trained physicians is now demonstrated. Reduction of the risk of death in the ICU, the ultimate safety enhancement, may be contributed to by error reduction, although this relationship has yet to be studied.

Our program demonstrates that remote critical care consultation can be effectively implemented as a risk reduction strategy. Early studies of remote critical care consultation [12, 13] concluded that the strategy could be implemented, but that full optimization of the process would require further study. More recently Celi [19] wrote that remote critical care management success "will hinge on hospitals accepting the underlying value proposition and physicians are willing to change established practices". Our initial experience supports this notion.

Further analysis of our project will focus on refining and improving operational factors and documenting the enhanced safety climate. Remote critical care consultation is one model of remote critical care management, contrasting with the continuous remote care model. Both models are in current practice in the US, with the continuous care versus consultative care choice based on health care system structure and resources. Robust outcomes analysis and operational characteristics may define environments better suited to one model or the other.

Figure 3.1.1 The Department of Defense eICU Program



4 Department of Defense eICU Program Objectives

4.1 How does the eICU serve our mission to improve patient care?

The eICU serves the combined mission of Tripler Army Medical Center, 121 Combat Support Hospital Guam and U.S. Naval Hospital Guam by providing remote access to medical specialists for veterans, active duty personnel and their families.

Similar to civilian healthcare providers, military medicine has faced difficult challenges of healthcare standardization in remote areas.

Doctors of all services in forward deployed military medical facilities have a common need for access, in real time, of expert advice and consultation for the care of their patients. There is substantial evidence that today's highly complex ICUs are best managed by specialists in intensive care. For example, the Leapfrog Group has found that mortality rates are up to 30 percent lower and lengths of stay (LOS) up to three days shorter in ICUs managed by Intensivists. The Leapfrog Group has made adequate intensivist staffing a criterion against which its payer members measure the performance of hospitals. At present, less than 10 percent of reporting hospitals meet these standards. There are simply not enough Intensivists in practice to permit all hospitals that maintain ICUs to staff them with even one full-time physician intensivist. Only about 4,000 intensivist physicians are now practicing in ICUs in the U.S. and many of them work in other areas of critical care, such as emergency departments and burn units.

The US Naval Hospital Guam (USNHG) and **The 121st Combat Support Hospital** are both forward deployed healthcare facilities that serve the U. S. Territories of the Marianas Island chain and South Korea, respectively. Both facilities have a six-bed, open staff model, medical-surgical ICU staffed by critical care nurses and respiratory therapists. Physician care is provided by non-Intensivists. Due to their remote location and relatively low patient census, it is not practical for USNHG or 121CSH to staff its ICU with a full time intensivist.

The eICU, comprised of eCareManager and Consulting Intensivist, has enhanced patient care in the USNHG and 121CSH ICUs by providing expertise and standardization of procedures. This activity supports both the combined missions of TAMC, USNHG and 121CSH by delivering remote access to medical specialists for the armed forces, their families and beneficiaries in Guam and South Korea.

**Intensivists are physicians specializing in critical care who have completed a fellowship in critical care medicine and are board-certified or board-eligible in critical care*.

How widely used is the eICU technology?
eICU's as complete, commercially packaged systems were introduced by VISICU in 2000. The first installation was in Hampton, Virginia, where a command center covered two Sentara Hospital ICUs. Since then approximately 40 command centers have been installed in the U.S. About 3,850 adult ICU beds, perhaps 4 percent of the total, are covered by eICU's. Although the licensing capacity of a command center currently permits coverage of up to 300 beds, most (about 60 percent) cover fewer than 100 beds.

What are some of the barriers to using eICU technology?
The increase in use of Tele-ICUs (as measured by either the number of new command centers or the number of new beds covered) peaked in 2004 and 2005[4]. Barriers to the adoption of Tele-ICUs by hospitals include the following:

- eICU's are expensive; Capital costs of construction, installation, and training for a new command center are often a minimum of to $5 million; Capital costs of adding another ICU to the system are approximately $250,000
- Annual operating costs of a command center are about $2 million
- Admitting physicians often resist sharing or delegating patient management to the command center Intensivists
- Physician fees for command center Intensivists are not currently reimbursed by insurers and must be paid for by the command center hospital as part of the operating expense
- Extending the coverage of a command center to ICUs outside its health care system requires organizational cooperation on issues of technology, finance, management of patient care, and referrals.
- Department of Defense Information systems require added security not usually required of commercial systems

What has been the experience of early-adopting hospitals?

There are few evaluations by early adopter hospitals and they offer only limited support for the value of eICU's. There are some reports of decreased mortality and length of stay (LOS), the two key outcome measures for ICUs. Some hospitals report clinical improvements such as higher rates of survival from emergency resuscitations and lower rates of hospital-acquired infections. Only one hospital system, Sentara, has published its findings in a study that compares patient outcomes before and after the installation of the Tele-ICU.[5] Sentara found that mortality, LOS, and financial measures all improved. Although other early adopters have not been able to replicate Sentara's strong findings, all reports suggest improvements in either key outcomes or in process and quality of care measures. (See Table 4.1.1 below.)

Table 4.1.1

Summary of Findings from Early Adopters – January 2006

Hospital and Year	Meet Leapfrog Standards?	Published?	ICU Mortality Change	Average ICU LOS Change/ Other Costs
Sentara (VA) 2000	Yes	Yes (2004)	25 percent reduction	5.6 to 4.8 days LOS (-14 percent) / -25 percent operating costs +20 percent ICU cases
Sutter (CA) 2003 & 2005	Yes	No	No significant change	No significant change in LOS / Reduced septic infections
Lehigh Valley (PA) 2004	Yes	No	Reduction from 15 percent to 10 percent all-cause mortality	ICU LOS reduced "more than projected"
Areva (SD) 2004	Not rated by Leapfrog	Conference abstract (2006)	Reductions in actual over projected mortality in 3 of 5 hospitals to which coverage extended	ICU LOS reduced against projected for severity of caseload/ Hospital LOS reduced
Memorial Hermann (TX) 2004	Not rated by Leapfrog	No	1.5-2 percent average reduction	Reduced LOS in 3 of 5 reporting ICUs

5 Anticipated eICU Benefits

5.1 In addition to patient safety, the eICU can leverage critical care physicians for enhanced peacetime and wartime capabilities

Military hospital care parallels civilian hospitals in practice, as well as challenges. As is the case in both, there is increasing pressure on the limited number of critical care physicians (Intensivists) to cover larger patient loads. The military has the additional challenges of providing top quality critical care to sometimes remote areas while maintaining a balance between facility capacity to meet surge demands and limited funding.

Anticipated peacetime savings from:

- ***Leveraging current critical care physicians to cover more patients.*** This allows for reducing costs associated with outsourcing patients to commercial hospitals and tempers pressure to expand active duty personnel end strength.
- ***Reduction of patient and physician travel.*** Program brings the expert care into remote and/or secondary hospitals. Besides the cost savings, reducing risk associated with moving the patient to a distant facility enhances patient outcomes.
- ***Increased overall patient capacity with no increase in infrastructure*** (secondary hospitals can handle more critical cases).
- ***Enhanced physician and RN quality of life yields gains in retention and recruiting***. Program enables these professionals to focus on what they do best, providing expert care.

Wartime capability enhanced by:

- Field hospital access to top-level expertise.
- Inherent surge and load leveling between multiple eICU's.
- Reduced requirement to surge stateside critical care expertise forward - thus reduced requirement for filling in behind physician vacancies using scarce reserve resources.
- Savings in logistic resources associated with patient and physician travel.

Patient Safety:

The Leapfrog group makes recommendations to improve patient safety. Because many patients are at risk and because the effect of ICU Physician Staffing (IPS) is large, the IPS standard has the greatest potential to impact patient safety and quality care. More than 5 million patients are admitted annually to ICUs in the United States. Ten percent of these patients die during their hospitalizations, and nearly all suffer preventable adverse events. Currently, only 10 percent of U.S. ICUs are staffed by Intensivists. Daily rounds by an intensivist can produce a three-fold reduction in risk-adjusted in-hospital mortality. If fully implemented in non-rural U.S. hospitals, this standard could prevent 54,000 deaths and save $5.4 billion annually.

Anticipated eICU cost savings

Costs:

Initial Investment:	$1,467,321	
Annual support costs:	$219,000	
Total		**$1,686,321**

Benefits: (per year)

To Airforce

Saved MEDEVAVS (actual because patients are ICU, emergent air evacuation savings)		$226,898

To Army

Tripler Army Medical Center - Saved inpatient costs, variable only		$88,780

To Navy

Guam Naval Hospital - Saved inpatient costs, variable only		$467,030

To DoD

Saved Quality Adjusted Life Years	$5,238,987	
Recouped ICU payments to TAMC from VA, additional beds	$9,875	
Recouped payments to Network providers	$51,801	
	$5,300,663	
Total		**$6,083,371**

6 Tripler Army Medical Center

6.1 Tripler Army Medical Center: Practicing Tomorrow's Medicine Today

TAMC is the largest military medical treatment facility in the Pacific Basin. Located a short distance from Waikiki, Tripler's area of responsibility spans more than 52 percent of the earth's surface. It is the only Army medical center in the Pacific. Plans for the current hospital were drawn in 1942 and construction was completed in 1948. The architecturally distinctive coral pink structure atop Moanalua Ridge was dedicated on September 10, 1948 and has been a familiar landmark on the south shore of Oahu ever since.

Tripler has approximately 231 hospital beds and is a major teaching center that provides graduate education programs in medicine, general surgery, otolaryngology, orthopedic surgery, psychiatry, pediatrics, obstetrics and gynecology, radiology, pathology, urology, oral surgery, hospital administration and anesthesiology nursing. Also included are obstetrics and gynecology-nursing courses. The staff is dedicated to providing state-of-the art medicine with state-of-the-art technology.

Beginning in April 2001, under the direction of then COL Benjamin Berg, Tripler Army Medical Center introduced intensivist remote consultation from Hawaii, to US Naval Hospital Guam (NHG), a distance of 3,811 miles. TAMC is a tertiary care referral center and teaching hospital, which provides specialist care for US military health care facilities throughout the Asia Pacific region. Intensivists are not available at most of the referring facilities, including USNHG and 121CSH, Korea.

Both USNHG and 121CSH are six-bed open staff model, medical-surgical ICUs staffed by critical care nurses and respiratory therapists. Physician care is provided by non-Intensivists. Daily consultation rounds are scheduled, taking advantage of a 20-hour time difference, across the international dateline. Remote consultation is enabled by a commercial FDA 510(k) cleared, HIPAA compliant telehealth solution, the "e-ICU®" (VISICU Inc Baltimore). Near real-time physiologic data, video images, and audio communication are accessed within a user-friendly software environment, over a dedicated 768 kbs frame relay ("partial T-1") connection. The system enables simultaneous real time data review by the ICU providers in Guam and Korea, with the intensivist consultant in Hawaii. Computer to computer videoconferencing between Hawaii based Intensivists and Guam based physician providers is an integral component of daily critical care rounds. Bi-directional audio-conferencing from patient rooms and one-way remote controlled-camera surveillance of patient rooms from Hawaii is enabled.

COL (Dr.) Benjamin Berg, an intensivist, operates the VISICU system at TAMC, the first military hospital to use the high-tech product for long-distance care of critically ill patients.

Tripler Army Medical Center

Department of Defense eICU Program

Director in Chief

COL Joseph Pina, MD

eICU Director

LTC Eric Crawley, MD

Principal Investigator

Dr. Benjamin Berg, University of Hawaii

Lead Project Manager

Mr. Daniel Horne, University of Hawaii

eICU Coordinator

Steven Sellner, RN

eICU Liaisons

Ms. Laurie Kalleberg, CCRN - Korea
LCDR Robert Krejci, CCRN - Guam

eICU Intensive Care Consultants

COL J Pina, MD
COL V Grbach, MD
Benjamin W. Berg, MD

LTC E Crawley, MD
MAJ P Lucero, MD
MAJ Donald Helman, MD

Other Specialists On-Call at Tripler Army Medical Center

Anesthesia
Cardiology
Clinical Perfusionist
Dental
Flight Surgeon
Family Practice
Gastroenterology
Hematology/Oncology
Infectious Disease
Maxillofacial Trauma
Neurology
Obstetrics/Gynecology
Orthopedic
Otolaryngology
Pathology
Pediatrics
Psychiatry
Pulmonary
Oral Surgeon
Plastic Surgeon
Thoracic Surgeon
Urology
Ophthalmology
Radiology

7 US Naval Hospital Guam

7.1 Connecting two Hospitals with 3,811 miles of fiber optic cable

U.S. Naval Hospital Guam is located 2 hours west of the International Date Line. The facility is 15 hours ahead of the East Coast, 18 hours ahead of the West Coast, and 20 hours ahead of Hawaii. NHG offers a full range of medical, surgical, and operational medicine services. The staff is approximately 650 military and civilian personnel.

U. S. Naval Hospital Guam: Where Navy Medicines Day Begins

In 1953 construction of the current NHG began on the cliffs overlooking Agana and the Philippine Sea. This facility opened in 1954, and continues to provide health care to Guam today. USNHG on the western Pacific US territory of Guam is a 59 bed, level 1 trauma, JCAHO accredited hospital 3,800 miles west of Honolulu, Hawaii, just north of the equator, with a staff of approximately 650 military and civilian personnel. The closest military medical facilities are located in Japan (Okinawa and Yokosuka) and Hawaii.

Historically, the U.S. government provided free hospital and health care services to the people of Guam. The U.S. Naval forces assumed responsibility for the island's medical needs at the turn of the 20th century when the United States took formal possession of Guam. These services continued with the U.S. Navy's delivery of care after World War II, and culminated with their donation of the first hospital facility of the Government of Guam's Department of Public Health and Welfare in the postwar era. This facility was replaced in 1956 with the construction of the Guam Memorial Hospital at Oka Point that originally served as a nurse training facility and tuberculosis hospital. As the need for hospital services increased, this Oka Point facility was renovated to serve as a 230-bed hospital that offered acute, psychiatric and long-term care services. The Guam Memorial Hospital's bed capacity is currently 192 beds; 159 acute care beds and 33 long-term beds in the Skilled Nursing Facility. The availability of beds for actual admissions, however, varies from time to time in accordance with the availability of fully trained and licensed staff. The hospital has relocated its Skilled Nursing Facility to its Barrigada Heights long-term care facility.

The NHG continues to provide primary, secondary and tertiary care for Guam’s 18,000 active duty and retired military personnel and their dependents. There is an estimated 15,000 veterans located in Guam that are also eligible for care within the walls of this facility.

Fig. 7.1.1 - Inpatient Services – Naval Hospital Guam

1	**Internal Medicine**	**11**	**Pediatrics**
2	**Multi-Service Unit**	**12**	**Nursery**
3	**General Surgery**	**13**	**C/P Nursery**
4	**Ophthalmology**	**14**	**Orthopedics**
5	**Oral Surgery**	**15**	**Psychiatry**
6	**Otorhinolaryngology**	**16**	**Family Practice**
7	**Urology**	**17**	**F/P Obstetrics**
8	**Gynecology**	**18**	**F/P Pediatrics**
9	**Obstetrics**	**19**	**F/P Gynecology**
10	**C/P Obstetrics**	**20**	**F/P Newborn Nursery**

U.S. Naval Hospital Guam

Fig. 7.1.2 Admissions to NHG by Specialty

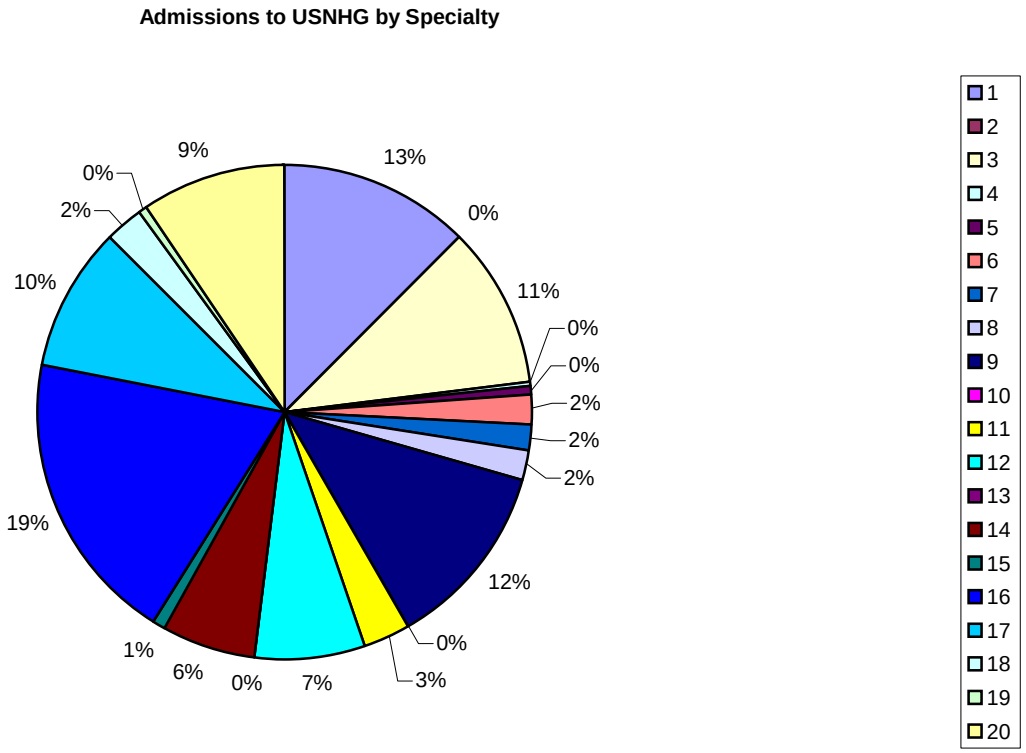
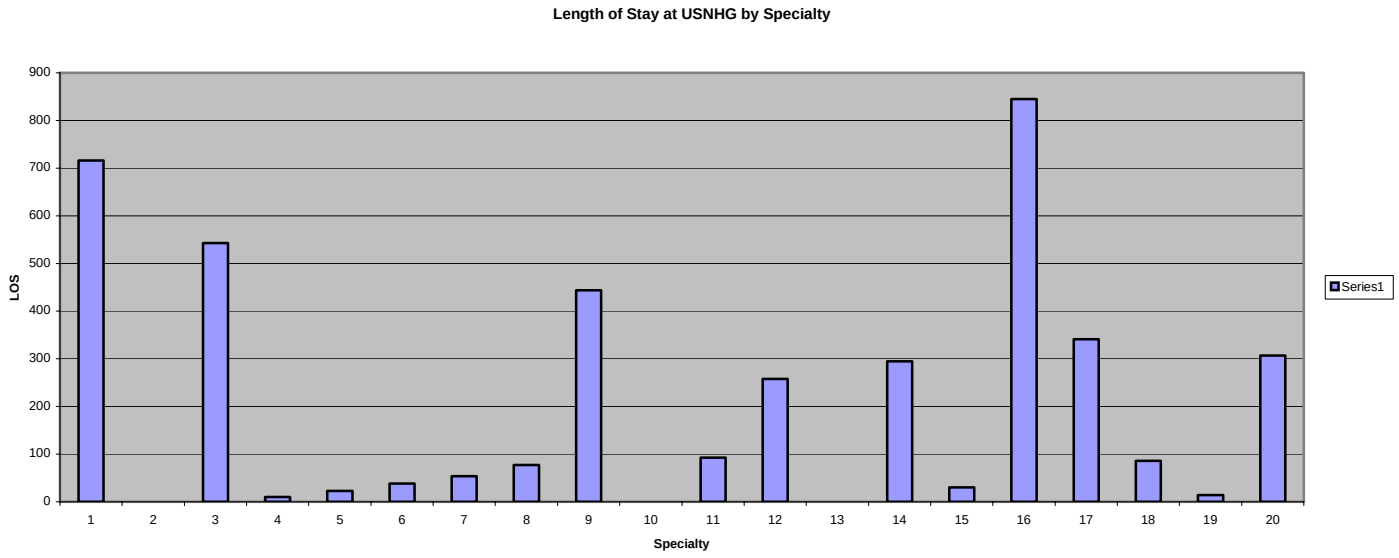


Fig. 7.3 Average Length of Stay for NHG Patients



8 121st Command Support Hospital, Seoul, Korea

8.1 We should all strive for excellence. We owe this commitment to ourselves and to our customers

The 121st Command Support Hospital is located in Seoul, Republic of Korea, and 3 hours west of the International Date Line. The facility is 16 hours ahead of the East Coast, 19 hours ahead of the West Coast, and 21 hours ahead of Hawaii. 121CSH offers a full range of medical, surgical, and operational medicine services.

The 121st Combat Support Hospital provides inpatient and outpatient care. It was originally activated in 1944 as the 121st Evacuation Hospital, Semi-mobile. It participated in the European Theater during World War II and in the Korean conflict. It has served continuously in Korea as a field unit since 25 September 1950 and as fixed medical treatment facility, Seoul Military Hospital, since 1959. In 1971 Seoul Military Hospital merged with the 121st Evacuation Hospital to become the U.S. Army Hospital, Seoul (121st Evacuation Hospital). On 16 April 1994, the 121st Evacuation Hospital reorganized and was redesigned the 121st General Hospital and the 121st Combat Support Hospital

HISTORY

The 121st Combat Support Hospital was organized and activated at Camp Swift, Texas, on 24 March 1944. The Unit was first committed to action on 25 March 1945 during the Battle for the Rhineland. The Hospital accompanied the Third Army in the Battle of Central Europe and on its drive to the Danube River. The Units' final operation position was established near Regensburg where it was located on VE Day, 8 May 1945. The 121st become a reserve unit after World War II until it was reactivated in 1950 for service in Korea. The Hospital participated in the Inchon invasion, the main body being put ashore on 25 September 1950. The Unit was moved to various positions throughout the peninsula until 30 May 1951. Then the Hospital was moved to its present location in Seoul on 18 May 1971.

The 121st General Hospital's decorations include:

- The Meritorious Unit Commendation for outstanding service in Korea from 25 September 1950 to 24 November 1951.
- The Republic of Korea Presidential Unit Citation for outstanding performance against the enemy from 25 September 1950 to 27 November1951.
- The Meritorious Unit Citation for outstanding service in Korea from 1 April 1952 to 15 September 1953.
- The Navy Meritorious Unit Commendation Medical for outstanding medical support to Marines injured in a helicopter crash 20 March 1989.
- The Hospitals' color includes eleven campaign streamers.

121 GH / 18th MEDCOM SCOPE OF SERVICES		
Alcohol Treatment Center	**Immunizations**	**Pediatrics**
Anesthesiology	**Neurology**	**Pharmacy**
Aviation Medicine	**Neurosurgery**	**Physical Medicine &**
Audiology	**Nutrition Care**	**Rehabilitation**
Chaplain Services	**Obstetrics**	**Physical Therapy**
Dental	**Occupational Therapy**	**Podiatry**
Dermatology	**Ophthalmology**	**Preventive Medicine**
EFMP/EDIS	**Optometry**	**Primary Care**
Family Practice	**Oral-maxillofacial Surgery**	**Psychiatry**
General Surgery	**Orthopedics**	**Radiology**
Gynecology	**Otorhinolaryngology**	**Social Work**
Emergency Medicine	**Pathology**	**Speech Pathology**
Internal Medicine		**Veterinary**

The 121 Command Support Hospital is now in phase two of a renovation project

The project is divided into 4 major phases. Phase Zero included utility upgrades and the construction of administrative buildings in preparation for demolition in the next phase of the project. Phase One is a Military Construction project that includes the demolition of part of the existing facility and the construction of a two-story addition and a single story ambulatory front addition. Phases Two and Three include the restoration of the remainder of the facility.

2002 ICU DATA

	Admissions	Deaths	PEDS	VENTS	MEDEVACS	Average Census
JAN	21	1	1	4	1	1.42
FEB	16	1	1	4	0	1.64
MAR	26	2	2	9	1	2.45
APR	23	0	0	3	2	2.13
MAY	23	3	2	6	2	2.52
JUN	29	0	1	1	7	2.33
JUL	24	0	1	4	0	2.03
AUG	19	1	2	3	3	1.81
SEP	27	1	1	6	1	1.87
OCT	25	1	4	4	5	2.16
NOV	25	1	3	5	1	1.57
DEC						

9 Naval Hospital Operations

9.1 Naval Hospital Guam Critical Care Services: Reaching for Excellence

TAMC has multiple Intensive Care Units separated and defined by specialty and subspecialty practices, the Naval Hospital has only one intensive care unit designed to care for a large variety of critically ill patients. While the Naval Hospital is able to deliver high quality of care to patients with single-organ failure, Aeromedical Evacuation is arranged for patients whose problems are complex or highly specialized.

Intensive Care Unit Division, U. S. Naval Hospital Guam

NHG's intensive care unit provides a range of complex multi-system life support functions to include continuous cardiac monitoring, one-to-one critical care nursing assessment and intervention, respiratory support care, advanced hemodynamic monitoring, the after-hours recovery of post-operative patients, and ward telemetry coverage for client population served. The unit has five beds and is expandable during times of contingency operations. The ICU admits approximately 300 patients yearly.

The ICU's treatment team is typically led by a general family practitioner who directs patient management and sees the patient as often as required by acuity but at least once daily. All unit Medical Staff members participate on NHG's Bioethical Committee.

The ICU's Unit Director is an Internist who maintains active and regular involvement in the care of patients in the unit. The Unit Director also oversees the administrative aspects of unit management including formation of policies and procedures, enforcement of unit policies, and the education of unit staff. The Unit Director's ability to assure the quality, safety, and its active participation in the review of the appropriate utilization of ICU resources in the hospital is essential.

A Nurse Manager maintains lines of authority, responsibility, and accountability for the delivery of high quality patient care. NHG's Nurse Manager typically has at least two years experience working in a critical care unit and previous management experience including experience with health information systems, quality improvement/risk management activities, and health care economics. The Nurse Manager fosters a cooperative atmosphere with regards to the training of nurses, physicians, respiratory therapists and other personnel involved in the care of critical care unit patients.

At least one physician, who can manage emergencies, including airway emergencies and is certified in ACLS, is available within 30 minutes. The following physician and specialists are available within 10 minutes: General Surgeon, Neurosurgeon and a Cardiovascular Surgeon. Critical care physicians appropriately credentialed to provide dedicated care to the critical care unit patients; a Pulmonologist and a Neurologist from TAMC are available for consultation via telephone within 30 minutes. Such activity historically has been conducted over the telephone and is now routinely available via the eICU.

Fig. 9.1.1 Number of NHG ICU Patients Admitted

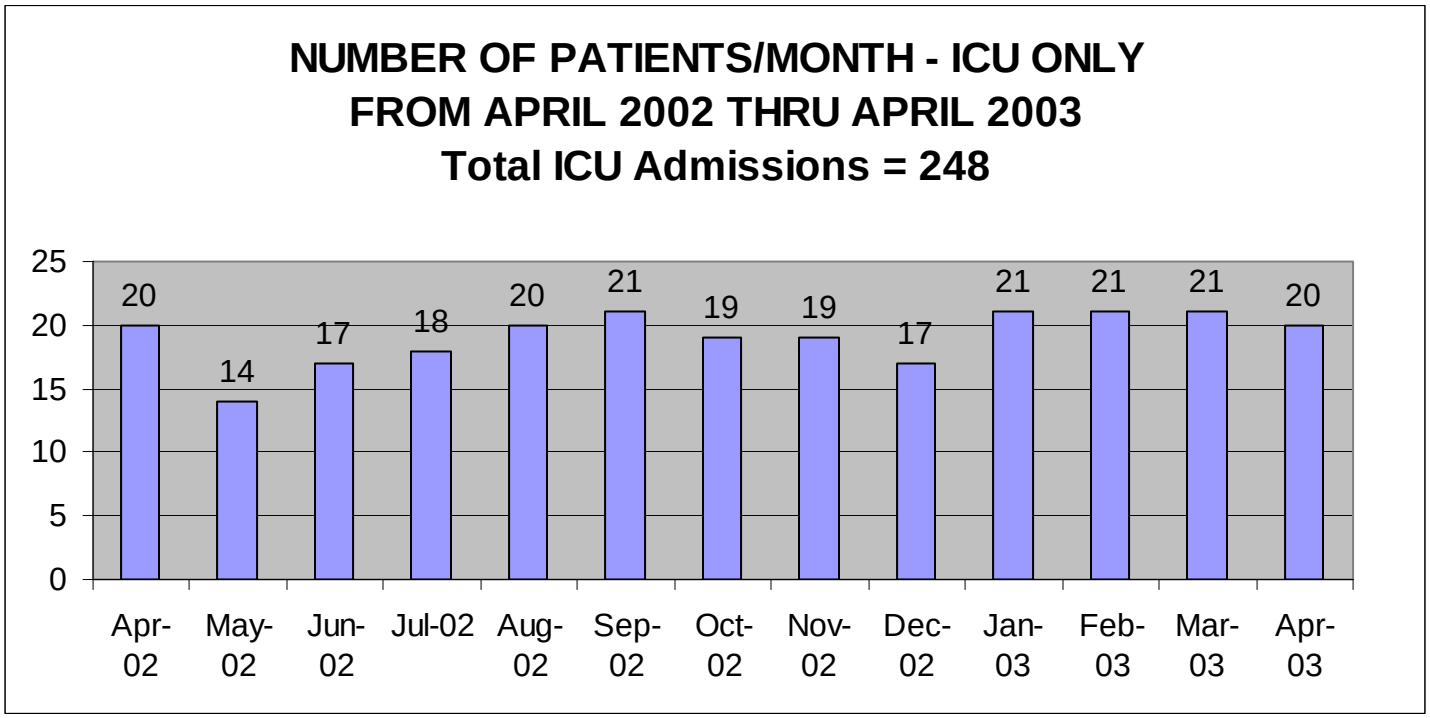
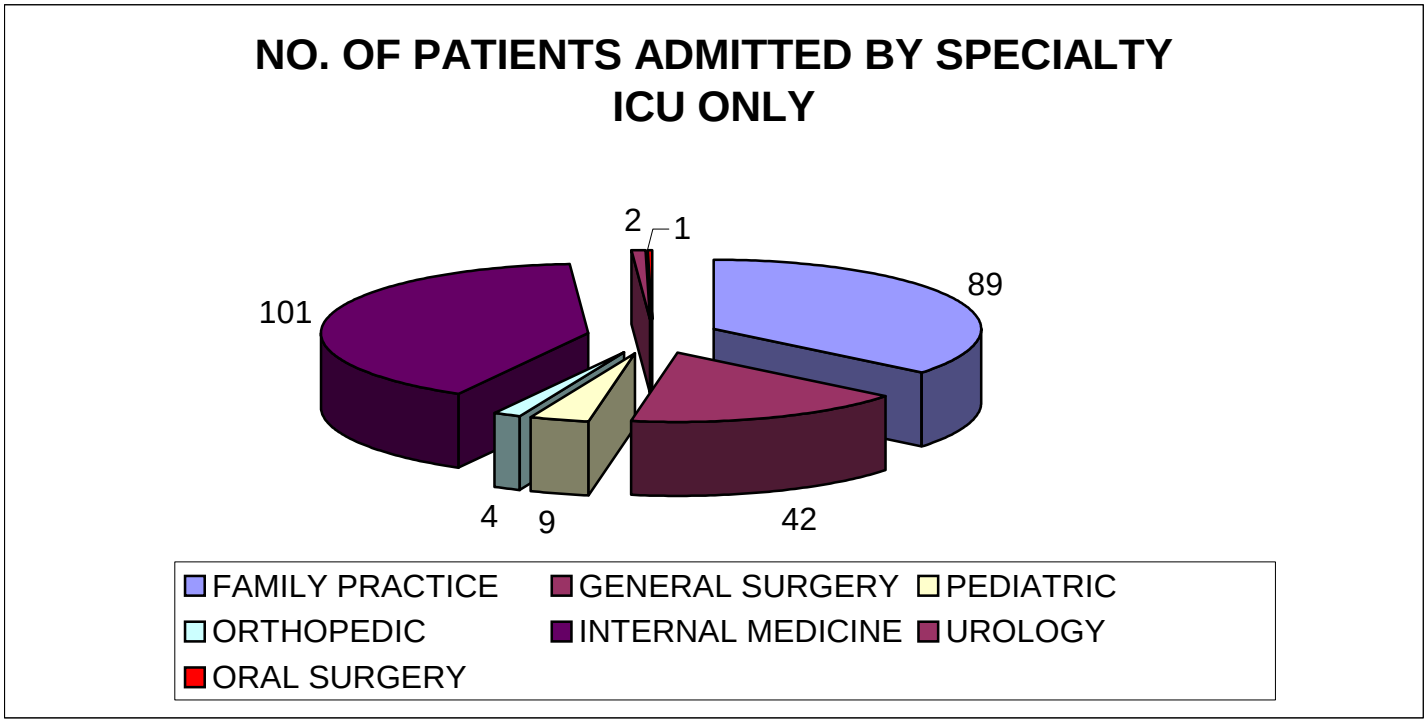


Fig. 9.1.2 U. S. Naval Hospital Guam ICU Patients by Specialty



10 Naval Hospital Operations

10.1 Naval Hospital Guam Critical Care Services: Reaching for Excellence

Many services and departments of Naval Hospital Guam work together to support the mission of the ICU.

Inpatient Nursing Services

All patient care in the Naval Hospital's ICU is carried out directly by or under supervision of a trained critical care nurse. Continuous nursing care is provided by two Registered Nurses on a 12 hour shift rotation.

Respiratory Therapy Services

Respiratory Therapy is part of the Internal Medicine Department and is based inside NHG's ICU. During the day there are two Respiratory Therapists available; one covers an eight hour day shift and one a 12 hour shift. Another Respiratory Therapist covers the night as part of a twelve hour shift. A respiratory therapist is on the unit at all times. A working knowledge of the principles of management of patients with acute respiratory failure is required. The therapist must be familiar with mechanical ventilators and with the range of ventilator modes. Proficiency in the transport of critically ill patients is required.

Pharmacy Services

Unit dosing and admixture services are provided by a registered pharmacist who monitors drug dosing and administration regiments, adverse reactions, drug/drug interactions, and cost containment issues.

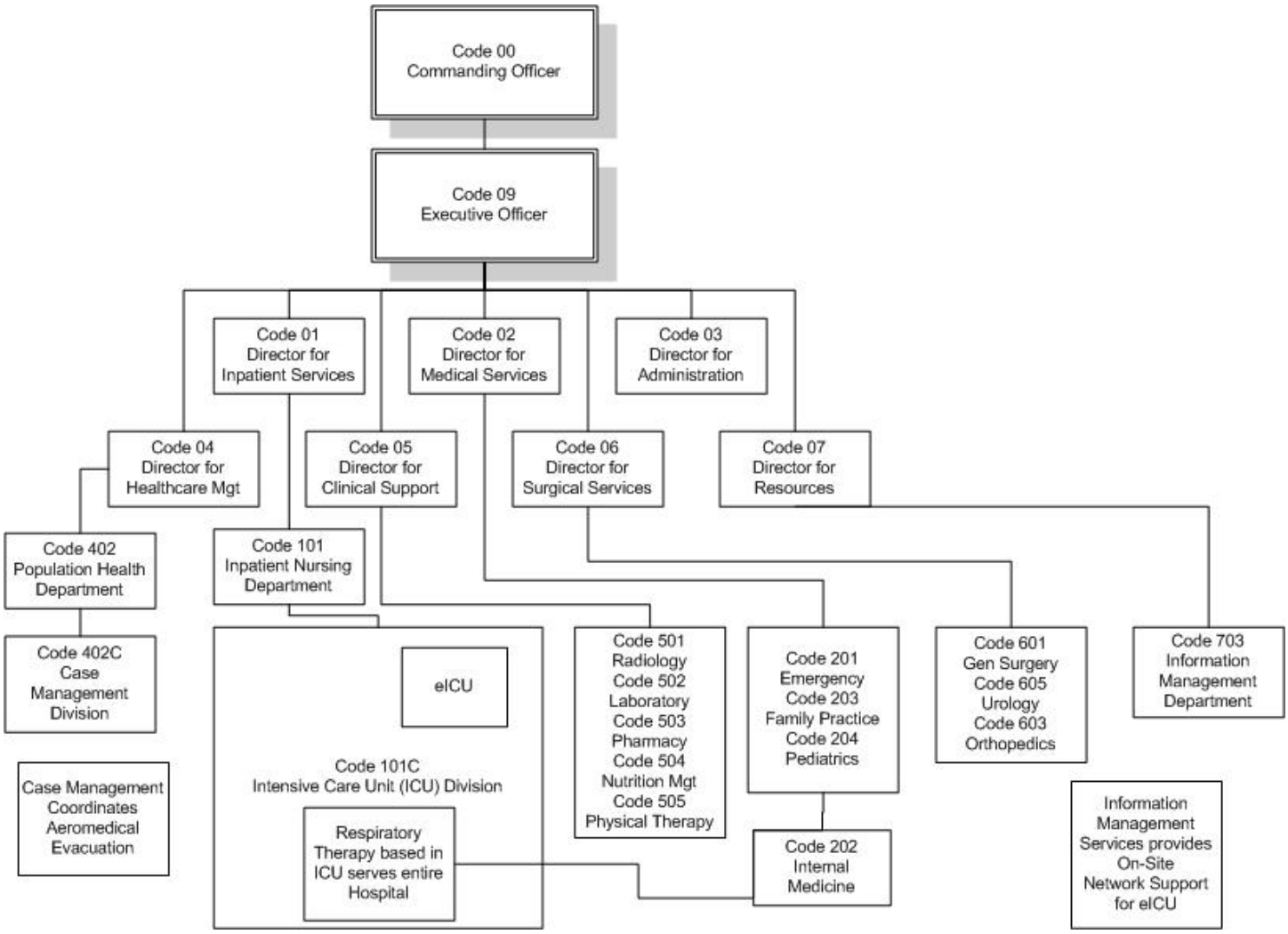
Laboratory Services

A clinical laboratory is available on a 24-hour basis to provide basic hematological, chemistry, and blood gas analysis.

Case Management Services

The Population Health Department provides case management of emergent and routine Aeromedical evacuation. Aeromedical evacuation is arranged for patients whose problems are complex or highly specialized. The 374th Aeromedical Evacuation Squadron at Yokota Air Base, Japan, works with the Aeromedical evacuation element of Hickam's 15th Aerospace Medicine Squadron to evacuate patients. When Yokota officials receive an emergency tasking, they first identify a hospital that can treat the patient. Next, they call the Tanker Airlift Control Center at Scott Air Force Base, Ill., to locate the closest available aircraft. Finally, they call the Hickam office, which at that point takes over arranging the mission. With assistance from reserve flight nurses and medical technicians, they care for in-transit patients while on the ground at Hickam and arrange ambulances between the flight line and TAMC. Every two weeks, they manage the "retro" mission, a C-141 delivering patients and borrowed medical equipment back to their home bases in the Western Pacific. Although the large C-141s are the primary aircraft used to ferry patients across the ocean, any aircraft will do for urgent medical evacuations. Last year there were four scheduled and 23 emergent Aeromedical Evacuations between U.S. Naval Hospital Guam and Tripler Army Medical Center.

Fig. 10.1.1 U. S. Naval Hospital Guam Command Structure



11 Naval Hospital Operations

11.1 Naval Hospital Guam Critical Care Services: Reaching for Excellence

U. S. Naval Hospital Guam's ICU has the capability of providing advanced patient monitoring and critical care support.

ICU Capabilities

NHG ICU has the capability of providing basic monitoring and patient support. In order to do so the ICU is prepared to provide:

Continuous monitoring of the electrocardiogram (with high/low alarms) to all patients
- Marquette MACVU Electrocardiograph
- Marquette MAC 5000 EKG
- 2 – Hewlett-Packard M1041A Patient Monitors
- 3 – Protocol System 106EL Physiologic Monitoring Systems

Continuous arterial pressure monitoring (invasive and non-invasive)
- Kendall 6325 Compression System
- Kendall 5325 Intermediate Compressor

Central venous pressure monitoring

Equipment to maintain the airway, including laryngoscopes and endotracheal tubes

Equipment to ventilate, including ambu bags, ventilators, oxygen, and compressed air emergency resuscitative equipment

Equipment to support hemodynamics, including infusion pumps, blood warmer, pressure bags, blood filters
- Braun 4891996A Nerve Stimulator
- Neurotron Medical S200 Nerve Stimulator
- Medtronic Life Pak 500 Neuromuscular Stimulator
- IMED PC-1 Infusion Pump
- 2 - IMED PC-2TX Infusion Pump
- 4 – IMED Gemini PC4 Infusion Pump

Transport policies, which address transport monitors, transport ventilators, and resuscitative equipment
- Protocol PROPAQ104E Transport Monitor
- Hewlett Packard M1277A Transport Monitor
- MLA MC-4HS Stretcher

Beds with removable headboard and adjustable position
- 5 – Hill Rom Century CC Electric Beds
- Midmark 500 Cribs Pediatric Bed

Adequate lighting for bedside procedures
- 2 – Burton 0224100 Surgical Lights
- Castle 304 Examination Light

Suction, Hypo-hyperthermia blankets, Scales
- Ohmeda ISU Intermittent Suction
- Ohio ISU Aspirator
- 2 - Allied Health 3040 Suction Pump
- 2 - Gomco 4040 Aspirator
- 2 - Gomco 6033 Aspirator
- 2 - Gomco 6030 Aspirator
- 2- Gast 4040 Suction Pumps
- 3- Ohmeda ISU Aspirator

Augustine Medic 500/OR Patient Warmer
Blickman Health 79-21-88 Blanket Warmer
7 - Allied Healthcare Vacutron wall suction unit

Temporary pacemakers
Agilent M4735A Defibillator
Medtronic 5375 Pacemaker
Medtronic 5348 Pacemaker

Temperature monitoring devices
3 – Welch Allyn 76751 Wall thermometer
Level 1 HL90A Blood Warmer

Pulmonary artery pressure monitoring

Cardiac output monitoring
Hedeco Fetal Heart Monitor

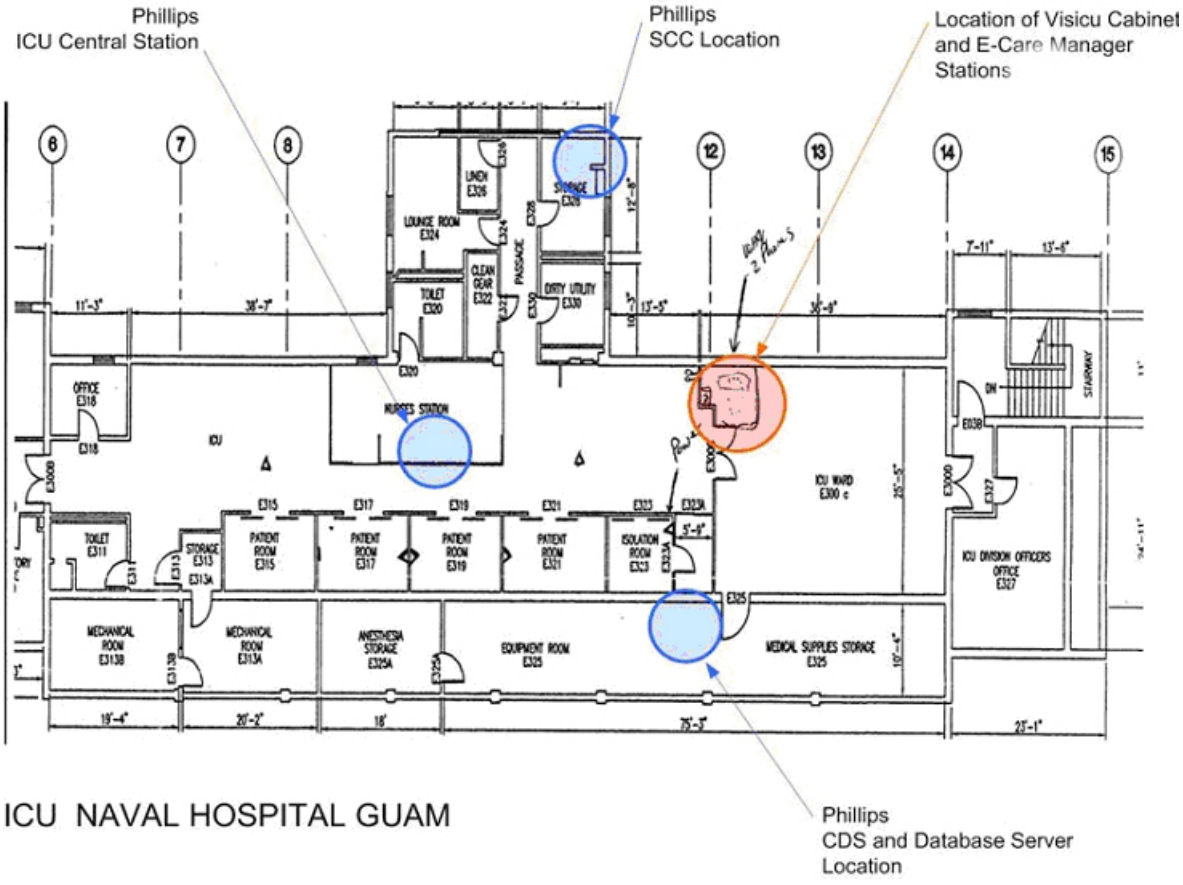
Inspired O monitoring ca ability for all ventilators

In-house availability of a CT scanner, cardiac catheterization lab, echocardiography, nuclear medicine testing and venous Doppler techniques.

Outside Services

Hemodialysis
Peritoneal dialysis

Fig. 11.1.1 Naval Hospital Floor Plan



12 121 Combat Support Hospital Operations

12.1 121 CSH, Korea Critical Care Services: Striving for Excellence

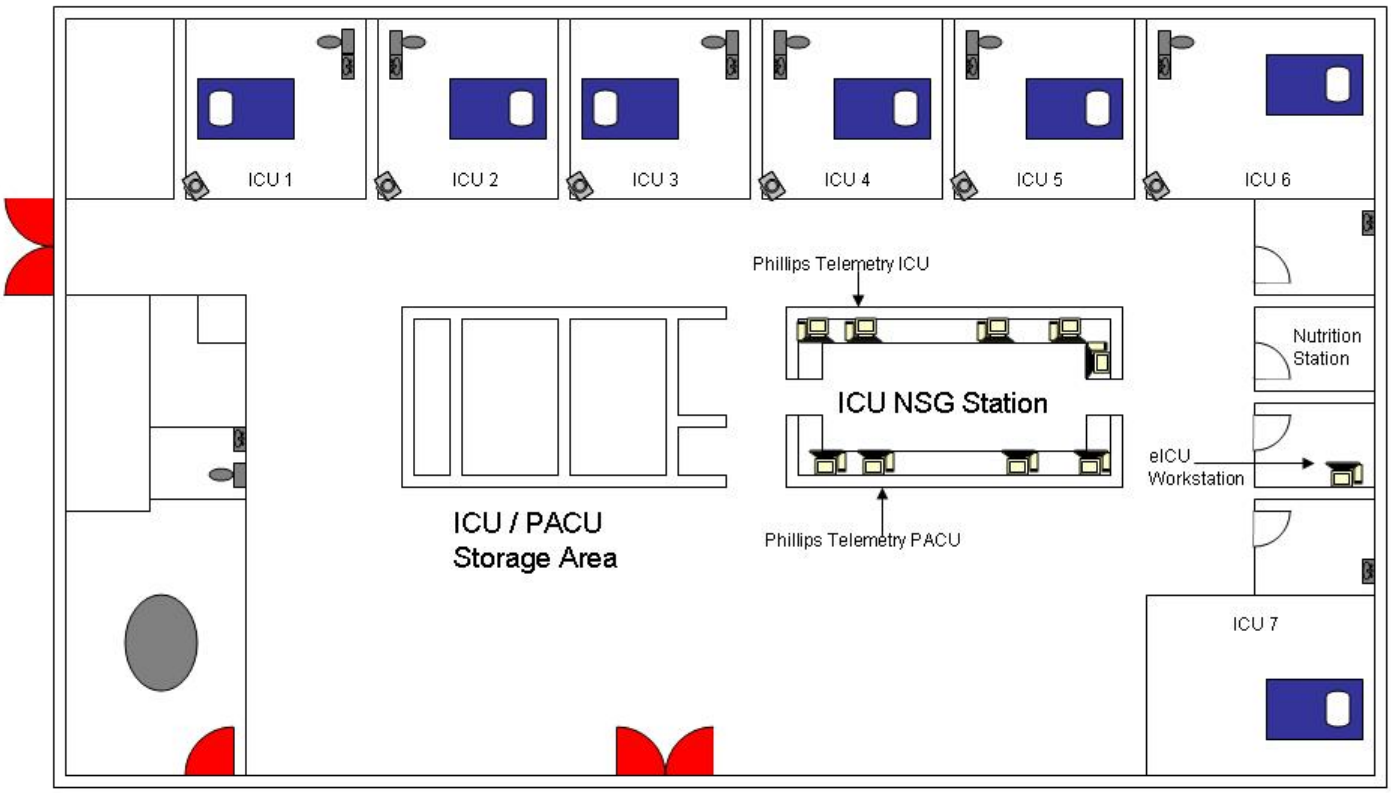
121 Combat Support Hospital's ICU has the capability of providing advanced patient monitoring and critical care support

ICU Equipment

Ambulatory Infusion Pumps		LIFECARE 4100 - Abbott Labs
		Alaris MedSystem III 2863 (14)
		Alaris 1310B (4)
Specialty Beds		Hill Rom TC-355 (4)
		Hill Rom TC-655 (2)
		Hill Rom P1900
		STRYKER BERTEC Crib
Defibrillators		Physio Control LifePAK 10
		Physio Control LifePAK 12 (2)
Enclosure Systems		Demistifier, Peace 2300P
Enteral Infusion Pumps		Kangaroo (2)
Hyper-hypothermia Units		Gaymar MED Therm III
Sequential Compression Devices		Health Care Logistics ALP-501 (5)
Suction Devices		Laerdahl A09401
		Impact Instruments 326M (2)
		SSCOR 2310B (2)
Syringe Pumps		MEDEX 20101(2)
Tympanic Thermometry		Genius 3000A
		Sherwood 3000A (2)
		Welch Allyn 679
Ultrasound		IMEX Free DOP
Cardiac Emergency Cart		
Bedside Monitor /w	Central Monitoring	Philips M1205A (7)
		Philips M8007A (6)
		Philips M3046A (3)
		Philips M3001A (6)
		Philips M1002B (6)
		Philips M1020A (6)
		Philips M1008B (6)
		Philips M1116B (6)
		Philips M3016A (6)
		Philips M1006B (6)
		Philips M1029A (6)
	ECG	GE Diasonics Ultrasound MAC 5000
	Pacing	
	External and Internal	
	Defibrillation	
	Portable	Welch Allyn ProPaq Encore 206EL (2)

Mechanical Ventilator	
Patient Weighing Devices	Seca Figura 851
Patient Weighing Devices (infant)	Scale Tronix 4802
Glucose Monitoring	Abbott PCX System
Transport	Winco 680 stretcher/chair
	Stryker 660 stretcher
Pulse Oximeter	BCI 3180 (6)
Vital Signs Monitor	GE Dynamap Pro 400V2

Figure 12.1.1 Current ICU Floor Plan – 121 Combat Support Hospital Korea



13 Technical Design

13.1 Topology/Architecture

The eICU uses two commercial circuit's one frame relay to Guam and a newer "Multi Protocol Label Switching" (MPLS) technology to Korea. Both circuits use virtual private networking protocol to connect the eICU system at TAMC with remote locations in Guam and Korea. These networking techniques ensure that confidential medical information is available only to medical and clinical personnel. The eICU network is a stand-alone system that does not connect to Department of Defense networking superstructure.

Gigabit Ethernet

The eICU system uses its own Gigabit Ethernet backbone in a hybrid star topology to connect servers and workstations. (An advantage of 1000BASE-T is that existing copper cabling can be used instead of having to rewire with optical fiber.) TAMC's eICU LAN includes 1000BASE-LX/LH and 1000BASE-T. Cabling at USNHG's eICU and between individual workstations is 100base-T or 100mbps Ethernet. For security reasons the eICU wide area network is a stand-alone system that does not connect to either the TAMC or USNHG networking superstructure or the Internet.

Frame Relay and MPLS

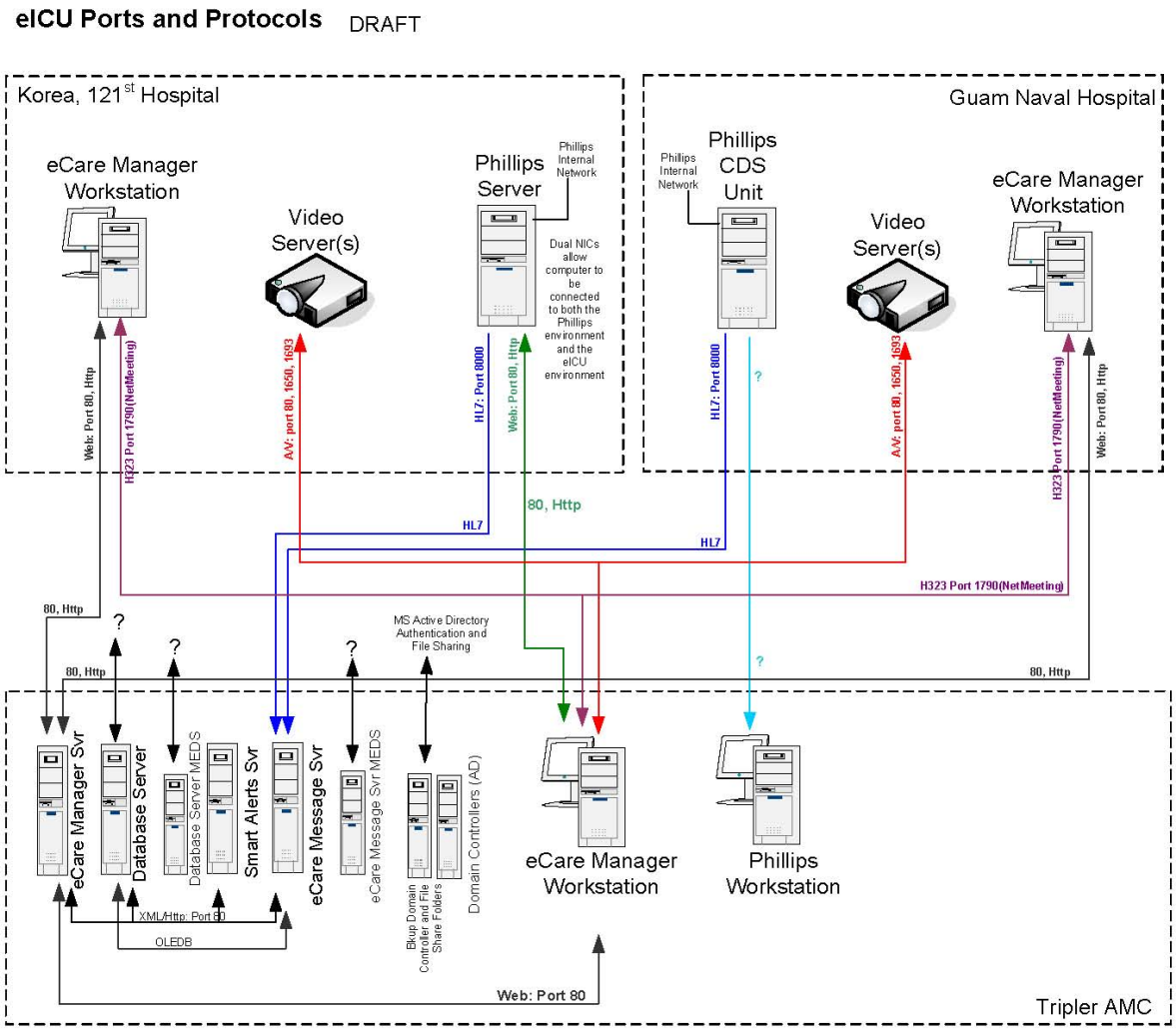
The eICU network connecting TAMC to USNHG utilizes a commercial Sprint frame relay circuit (768kbps). Frame relay is a telecommunication service designed for cost-efficient data transmission for intermittent traffic between local area networks (LANs) and between end-points in a wide area network (WAN). Frame relay puts data in a variable-size unit called a frame and leaves any necessary error correction (retransmission of data) up to the end-points, which speeds up overall data transmission. For most services, the network provides a permanent virtual circuit (PVC) which means that the customer sees a continuous, dedicated connection without having to pay for a full-time leased line, while the service provider figures out the route each frame travels to its destination and can charge based on usage. The Sprint circuit connecting TAMC to 121CSH Korea uses the newer MPLS networking technology. MPLS provides a flexible alternative to frame relay by pre-appending packets with an MPLS header, containing one or more 'labels'. This is called a label stack. The MPLS headers are then read by special routers owned by the commercial circuit provider without examining the IP packet information below the stack. A Multipoint layer 2 VPN for Ethernet, is then implemented using Virtual Private LAN Service (VPLS) and MPLS pseudo wires (ATOM). It builds on the foundation of point-to-point layer 2 MPLS VPNs to extend an Ethernet broadcast domain across multiple service providers. The VPLS network appears as a private Ethernet switch to the attached MPLS end site.

VPN

The eICU uses a virtual private network (VPN) as a way to use a public telecommunication infrastructure, such as the Sprint Optical Cable in the Pacific Ocean, to provide physicians with secure access to their patient's medical information. A virtual private network can be contrasted with an expensive system of owned or leased lines that can only be used by one organization. The goal of a VPN is to provide the organization with the same capabilities, but at lower cost. The eICU VPN network uses the shared public infrastructure while maintaining privacy through a security protocol called 3DES IPSEC. In effect, the protocols, by encrypting data at the sending end and decrypting it at the receiving end, send the data through a "tunnel" that cannot be "entered" by data that is not properly encrypted. An additional level of security involves encrypting not only the data, but also the originating and receiving network addresses. Encryption is the transformation of data to a form, which is impossible to read without the appropriate knowledge or key. There are different approaches to cryptography, like public /

secret key encryption, and different algorithms are used for each type of system. **3DES** is a cryptosystem, which can encrypt and decrypt data using a single secret key, which is 168 bits long.

Figure 13.1.1 eICU Network Ports and Protocols



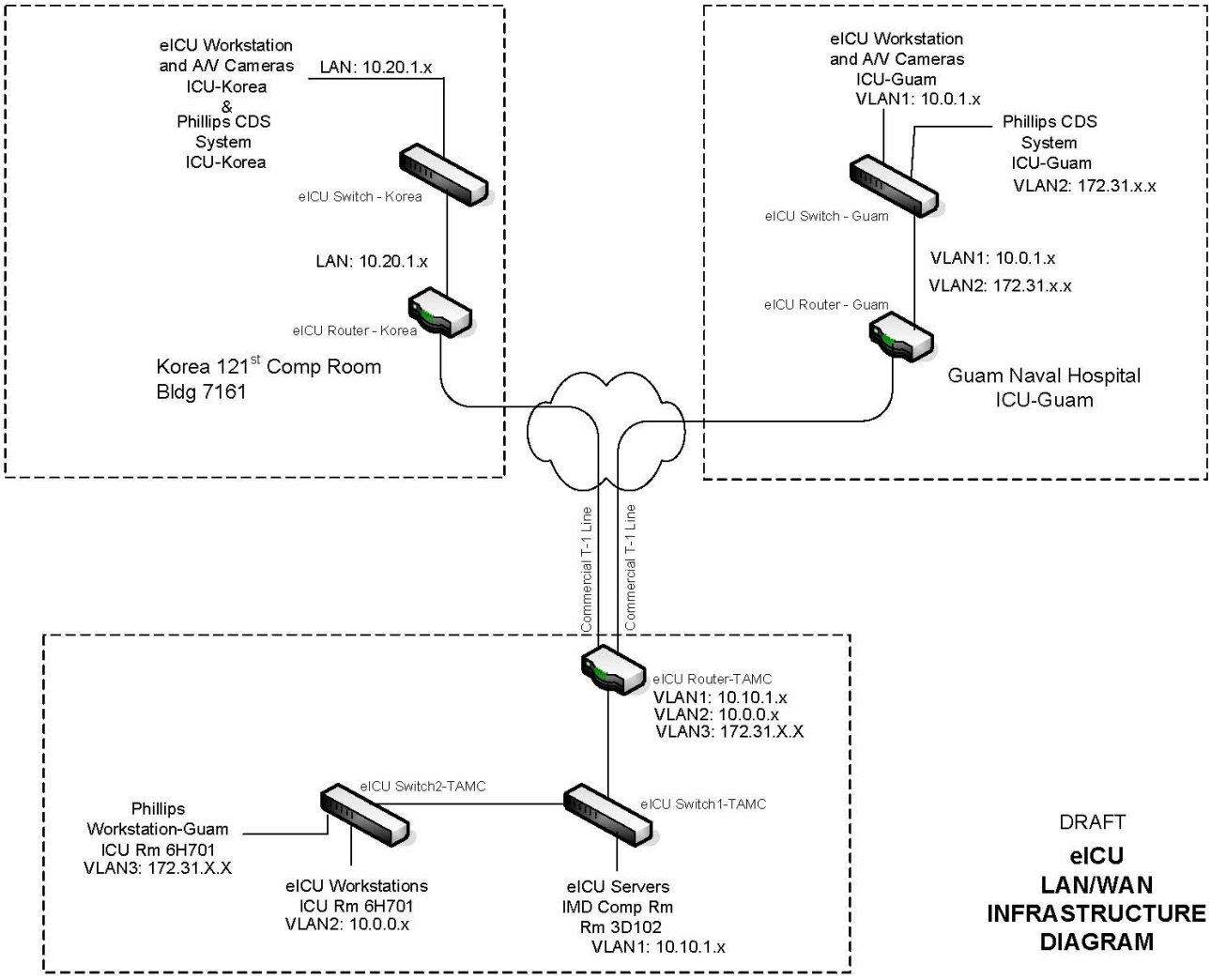


Figure 13.1.2 eICU LAN/WAN Infrastructure

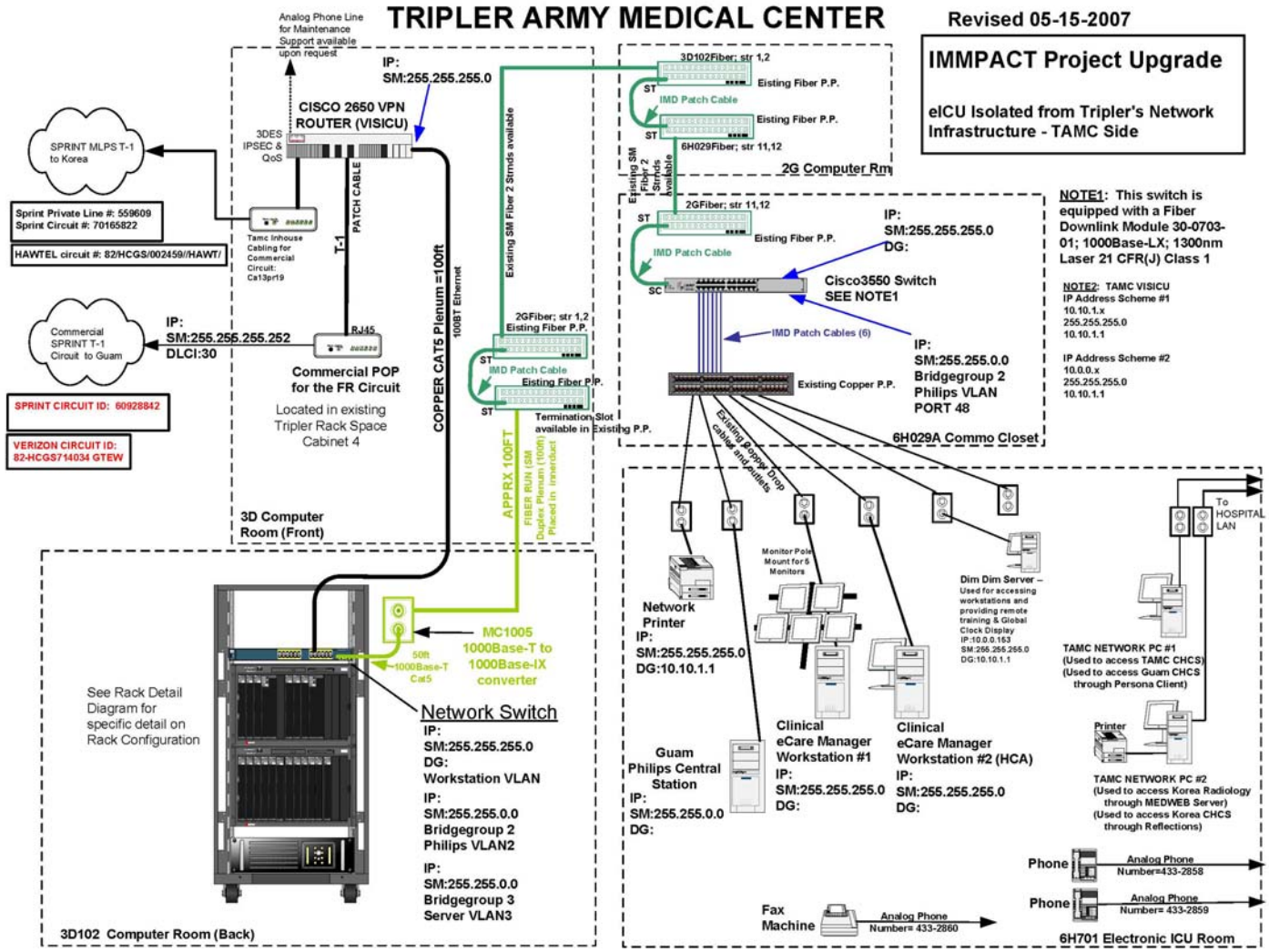


Figure 13.1.3 eICU Equipment Upgrade

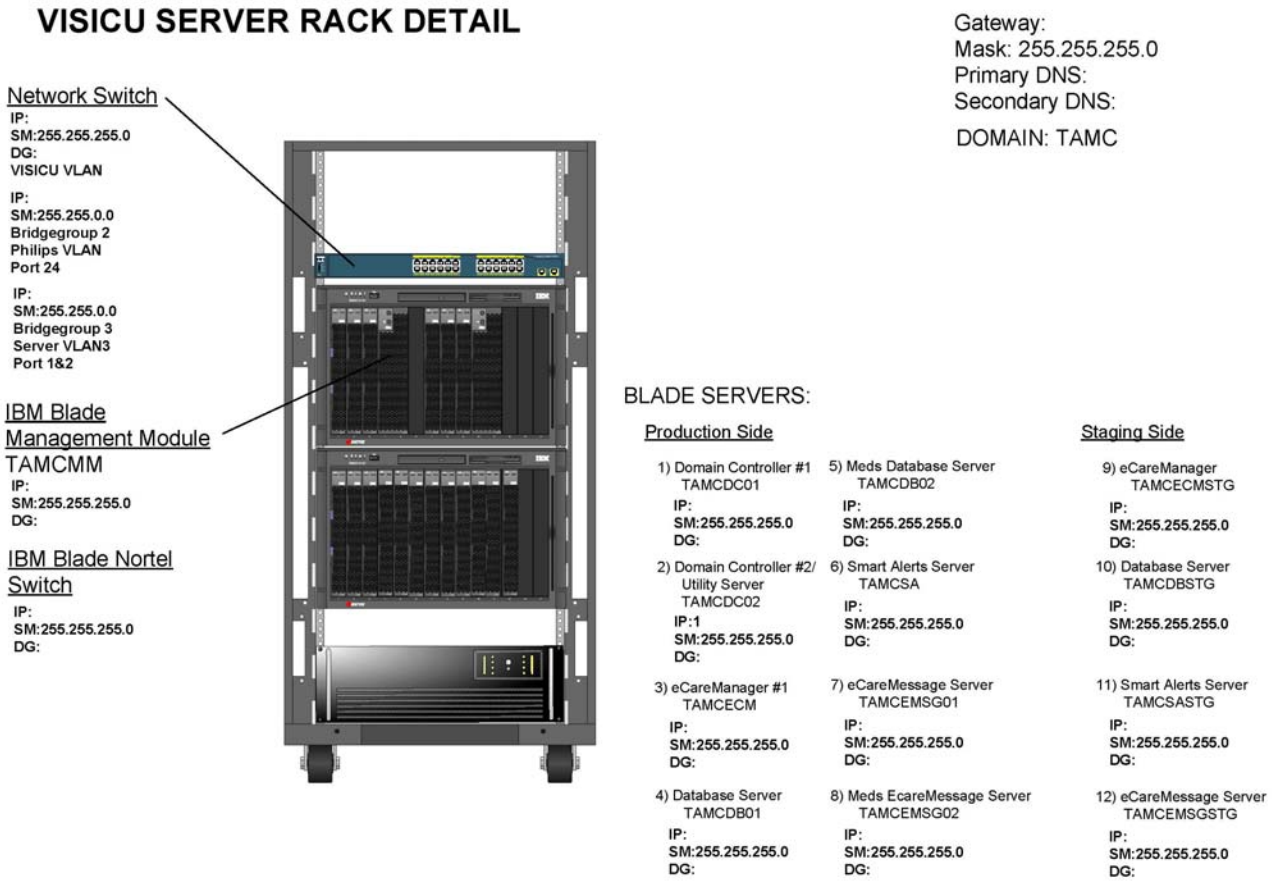


Figure 13.1.4 eICU Servers

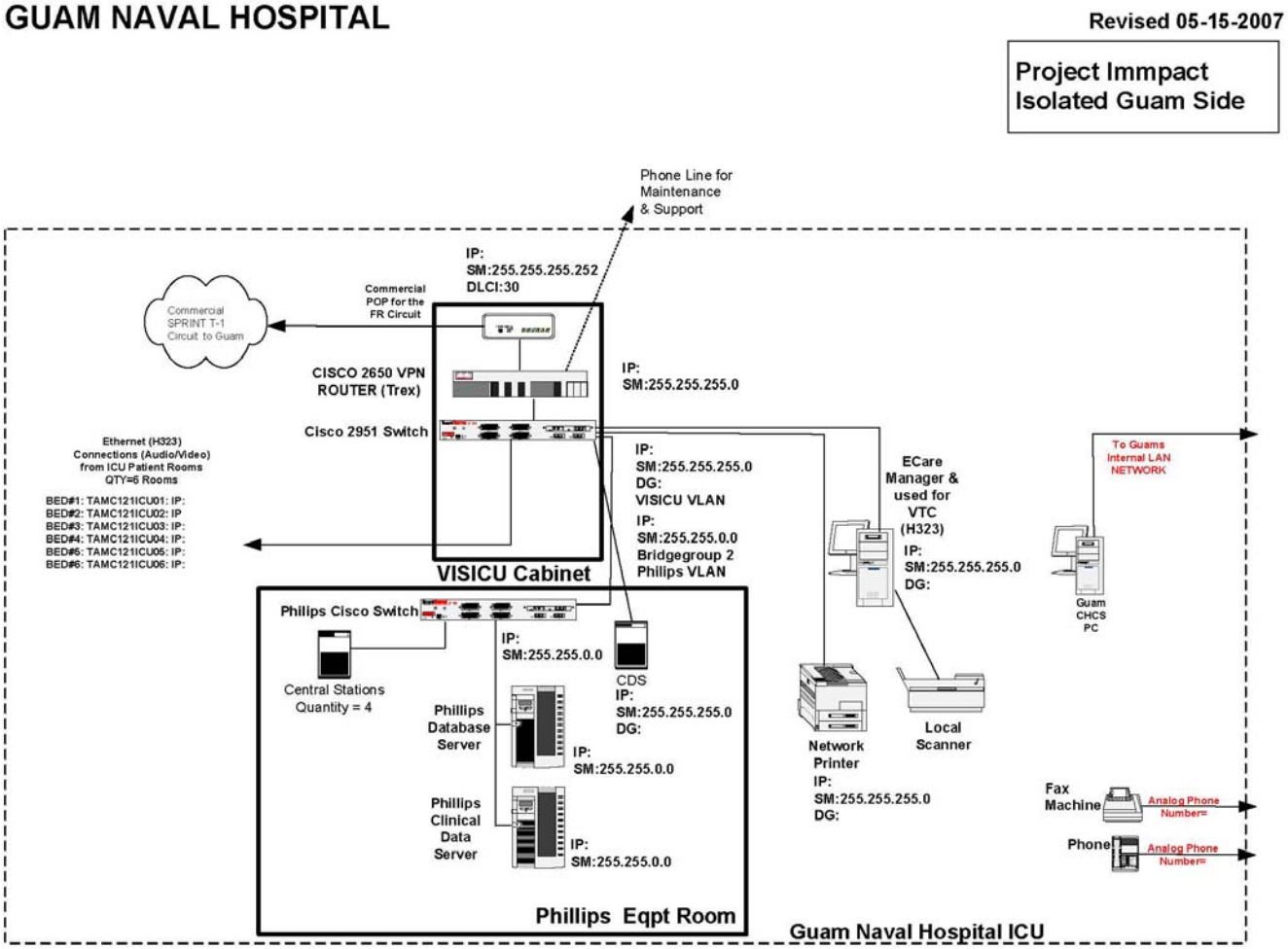


Figure 13.1.5 US Naval Hospital Guam eICU Equipment

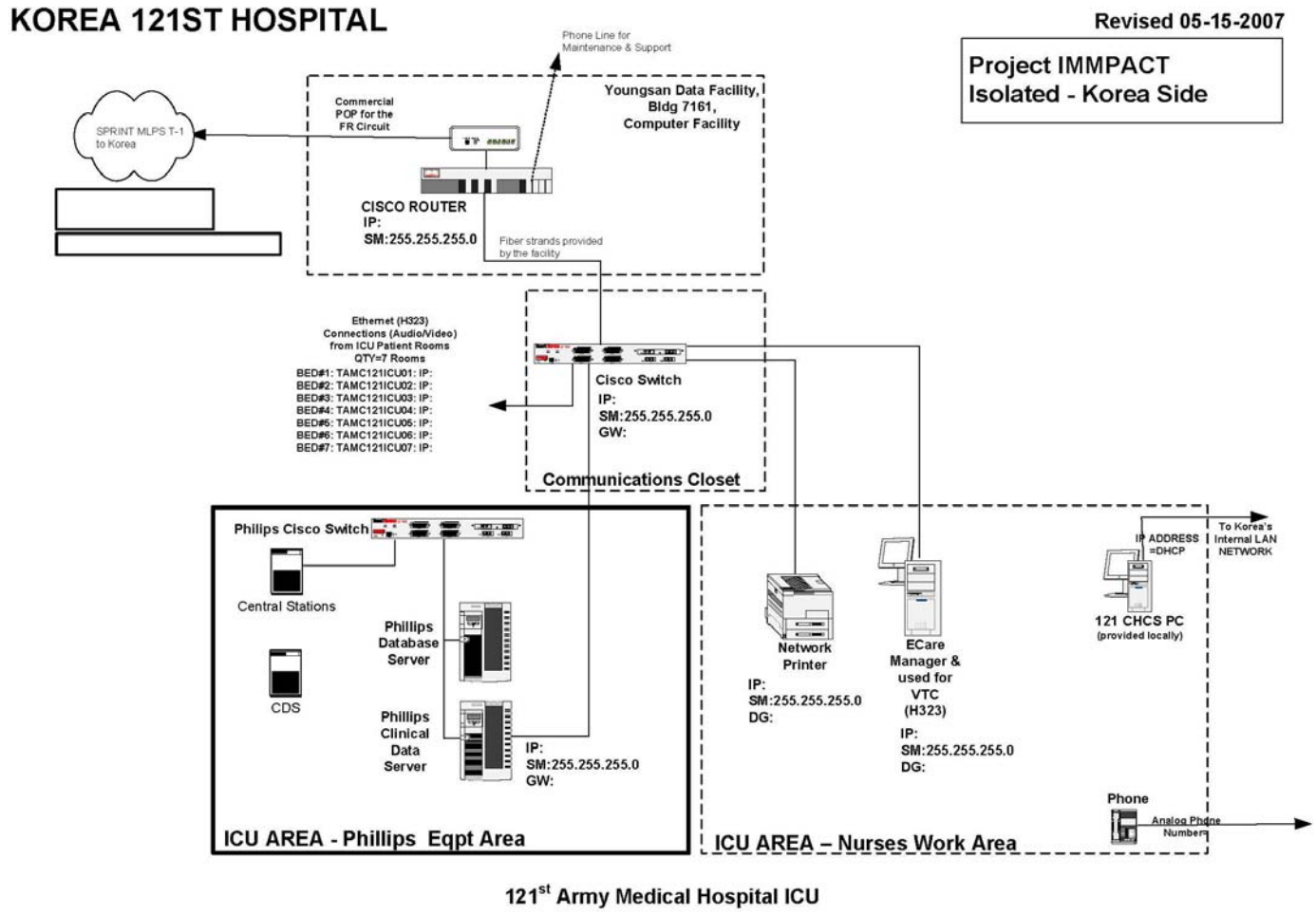


Figure 13.1.6 121 Combat Support Hospital eICU Equipment

14 eICU System Operation

14.1 Procedures for System Startup, Routine Consultation, Patient Management, Archiving of Data and System Power Down

The eICU coordinator ensures that the eICU system is in working order and that essential patient information is available to the consultant in eCareManager and the TAMC patient chart. The eICU Liaison, Nurse Manager or Division Officer at the remote location serves as the point of contact for coordination of daily eICU consultations.

System Startup

The eICU Coordinator typically arrives at the TAMC eICU at 10:00 Hawaii Standard Time (HST), 06:00 Chamorro Standard Time (ChST) and 05:00 Korea time to ensure that the eICU system is in working order and to prepare for the days consultations. Only the system monitors are turned on at this time as the workstations are routinely left on and booted at all times. The eICU coordinator then telephones the remote Intensive Care Nursing Station to see if there are any physicians in their unit requesting a consultation on their patient(s). If the remote location is planning eICU consultations for that day, the eICU coordinator requests that the night clinical staff (NOC) enter the patient's demographic information, patient identification number (PID) (typically the patient's Medical Record Number) and admission height/weight into eCareManager. The night NOC staff is also requested to enter the same PID into the Philips monitor. The eICU coordinator then verifies that this information has been entered correctly and notifies the TAMC consultant of patients scheduled for that day.

Entering Patient Information into eCareManager

The remote locations' Medical staff typically arrives after 06:00 and begins to enter an Admission or Comprehensive Progress Note on their patient. The eICU coordinator typically enters lab results and blood gasses for scheduled patients after 10:30 HST. This information is retrieved remotely from the remote locations CHCS database and entered in eCareManager. A hard copy of the labs and the remote locations' physicians notes, and other patient medical information is then scanned into the remote locations shared network folder. This information is then available for inclusion in the patient's TAMC eICU chart. X-rays are typically ready to be scanned by the Guam radiographic technician or physician by 07:00 ChST. 121CSH Korea X-Rays are available from the eICU's remote access the 18th MEDCOM's MedWeb. The remote locations' Clinical Staff typically finishes their morning report after 07:30 and is available to enter Inputs and Outputs and other flowchart information before consultation rounds at 08:00. TAMC Consultants typically enter a brief progress note on each patient after eICU rounds have been completed.

Patient Management

Patient management is coordinated by the remote locations' medical and clinical staff. ICU's can be understood in terms of their Task and Workflow predictability. Task predictability is managed by adapting staff qualifications, the degree of task differentiation and standardization. As patient acuity increases task predictability typically decreases. Workflow predictability refers to the collective units ability to plan admission, discharge and transfer activity. Highly qualified medical and clinical personnel will typically staff an ICU with low task and workflow predictability. The eICU affects task and workflow unpredictability by introduction of a consulting intensivist. As the eICU consultant is not at this time available on a 24 hour 7 day a week basis, a decrease in workflow predictability could adversely affect patient outcomes. The Consulting Intensivist will increase task predictability by providing expertise and standardization. However the TAMC eICU does not have any control over the remote locations workflow or their decision to request eICU consultations on their patients.

Archiving of Data

Patient Information stored in eCareManager is archived when the patient is discharged from the system. However, eICU patients discharged within the system can be readmitted at a later date. All patient information generated by eCareManager and the remote locations' ICU are stored in the TAMC eICU paper medical record. The paper eICU Medical Records are stored in a locked cabinet within the controlled access area of the eICU.

Figure 14.1.1 Guam eICU Schedule

Tripler Army Medical Center eICU Program							
HAWAII Time	Mon TAMC eICU	Tue TAMC eICU	Wed TAMC eICU	Thu TAMC eICU	Fri TAMC eICU	GUAM Time	KOREA Time
9:00-9:30	EICU Coordinator Telephones Guam for Consultation Schedule	EICU Coordinator Telephones Guam for Consultation Schedule	EICU Coordinator Telephones Guam for Consultation Schedule	EICU Coordinator Telephones Guam for Consultation Schedule	EICU Coordinator Telephones Guam for Consultation Schedule	5:00-5:30	4:00-4:30
9:30-10:00	Night Shift RN Enters Patient	Night Shift RN Enters Patient	Night Shift RN Enters Patient	Night Shift RN Enters Patient	Night Shift RN Enters Patient	5:30-6:00	4:30-5:00
10:00-10:30	Night Shift RN Enters Clinical Data	Night Shift RN Enters Clinical Data	Night Shift RN Enters Clinical Data	Night Shift RN Enters Clinical Data	Night Shift RN Enters Clinical Data	6:00-6:30	5:00-5:30
10:30-11:00	eICU Coordinator Enters Labs	eICU Coordinator Enters Labs	eICU Coordinator Enters Labs	eICU Coordinator Enters Labs	eICU Coordinator Enters Labs	6:30-7:00	5:30-6:00
11:00-11:30	Attending Enters Medical Data	Attending Enters Medical Data	Attending Enters Medical Data	Attending Enters Medical Data	Attending Enters Medical Data	7:00-7:30	6:00-6:30
11:30-12:00	Day RN Enters I&Os	Day RN Enters I&Os	Day RN Enters I&Os	Day RN Enters I&Os	Day RN Enters I&Os	7:30-8:00	6:30-7:00
12:00-12:30	Consultation	Consultation	Consultation	Consultation	Consultation	8:00-8:30	7:00-7:30
12:30-13:00	Consultation	Consultation	Consultation	Consultation	Consultation	8:30-9:00	7:30-8:00
13:00-13:30	Consultation	Consultation	Consultation	Consultation	Consultation	9:00-9:30	8:00-8:30
13:30-14:00	Consultation	Consultation	Consultation	Consultation	Consultation	9:30-10:00	8:30-9:00
14:00-14:30	Consultant Enters Consult Note	Consultant Enters Consult Note	Consultant Enters Consult Note	Consultant Enters Consult Note	Consultant Enters Consult Note	10:00-10:30	9:00-9:30
	Tue USNHG ICU	Wed USNHG ICU	Thu USNHG ICU	Fri USNHG ICU	Sat USNHG ICU		
	121SCH ICU	121SCH ICU	121SCH ICU	121SCH ICU	121SCH ICU		

Figure 14.1.2 Korea eICU Schedule

Tripler Army Medical Center eICU Program							
HAWAII Time	Mon TAMC eICU	Tue TAMC eICU	Wed TAMC eICU	Thu TAMC eICU	Fri TAMC eICU	GUAM Time	KOREA Time
9:30-10:00	EICU Coordinator Telephones Korea for Consultation Schedule	EICU Coordinator Telephones Korea for Consultation Schedule	EICU Coordinator Telephones Korea for Consultation Schedule	EICU Coordinator Telephones Korea for Consultation Schedule	EICU Coordinator Telephones Korea for Consultation Schedule	5:30-6:00	4:30-5:00
10:00-10:30	Night Shift RN Enters Patient	Night Shift RN Enters Patient	Night Shift RN Enters Patient	Night Shift RN Enters Patient	Night Shift RN Enters Patient	6:00-6:30	5:00-5:30
10:30-11:00	Night Shift RN Enters Clinical Data	Night Shift RN Enters Clinical Data	Night Shift RN Enters Clinical Data	Night Shift RN Enters Clinical Data	Night Shift RN Enters Clinical Data	6:30-7:00	5:30-6:00
11:00-11:30						7:00-7:30	6:00-6:30
11:30-12:00	eICU Coordinator Enters Labs	eICU Coordinator Enters Labs	eICU Coordinator Enters Labs	eICU Coordinator Enters Labs	eICU Coordinator Enters Labs	7:30-8:00	6:30-7:00
12:00-12:30	Attending Enters Medical Data	Attending Enters Medical Data	Attending Enters Medical Data	Attending Enters Medical Data	Attending Enters Medical Data	8:00-8:30	7:00-7:30
12:30-13:00	Day RN Enters I&Os	Day RN Enters I&Os	Day RN Enters I&Os	Day RN Enters I&Os	Day RN Enters I&Os	8:30-9:00	7:30-8:00
13:00-13:30	Consultation	Consultation	Consultation	Consultation	Consultation	9:00-9:30	8:00-8:30
13:30-14:00	Consultation	Consultation	Consultation	Consultation	Consultation	9:30-10:00	8:30-9:00
14:00-14:30	Consultation	Consultation	Consultation	Consultation	Consultation	10:00-10:30	9:00-9:30
14:30-15:00	Consultation	Consultation	Consultation	Consultation	Consultation	10:30-11:00	9:30-10:00
15:00-15:30	Consultant Enters Consult Note	Consultant Enters Consult Note	Consultant Enters Consult Note	Consultant Enters Consult Note	Consultant Enters Consult Note	11:00-11:30	10:00-10:30
	Tue USNHG ICU / 121SCH ICU	Wed USNHG ICU / 121SCH ICU	Thu USNHG ICU / 121SCH ICU	Fri USNHG ICU / 121SCH ICU	Sat USNHG ICU / 121SCH ICU		

System Power Down

After consultations rounds have been completed, the eICU coordinator will complete patient charts with the days consultation note and place the charts in the medical record cabinet. The eICU coordinator then ensures all sessions of eCareManager have been logged off and turns off the system monitors.

15 eICU System Operation

15.1 Workflow – Enhancing Patient Care with a More Detailed Record

Structured medical documentation encourages the recording of specific or otherwise unincorporated information. Using eCareManager and on-line decision support can improve the quality of documentation, enhancing patient outcomes.

Entering Essential Patient Enrollment Information into eCareManager

To ensure a consultation based on structured medical information a patient must be entered into eCareManager. The following minimal information must be entered into eCareManager to admit the patient to the eICU:

- Correct bed number
- Patient ID, typically the last four digits of their social security number
- Health system admission date and time
- ICU admission date and time
- Admission source
- Admitting physician
- Patients, first and last name, date of birth, gender and ethnic code
- Patient's height and weight

Entering Essential Patient Enrollment Information into Philips

The patients' bed number and patient identification number in Philips must match exactly the bed and patient identification number entered into eCareManager. If this information is different and does not match then "trending" information from Philips will not be transferred into eCareManager.

Entering Essential Admission Information

Admission information essential for an eICU consultation include:

- Admission and current diagnosis
- Code status
- Allergies
- Pre-admission medications
- Past history
- System review
- Physical Exam

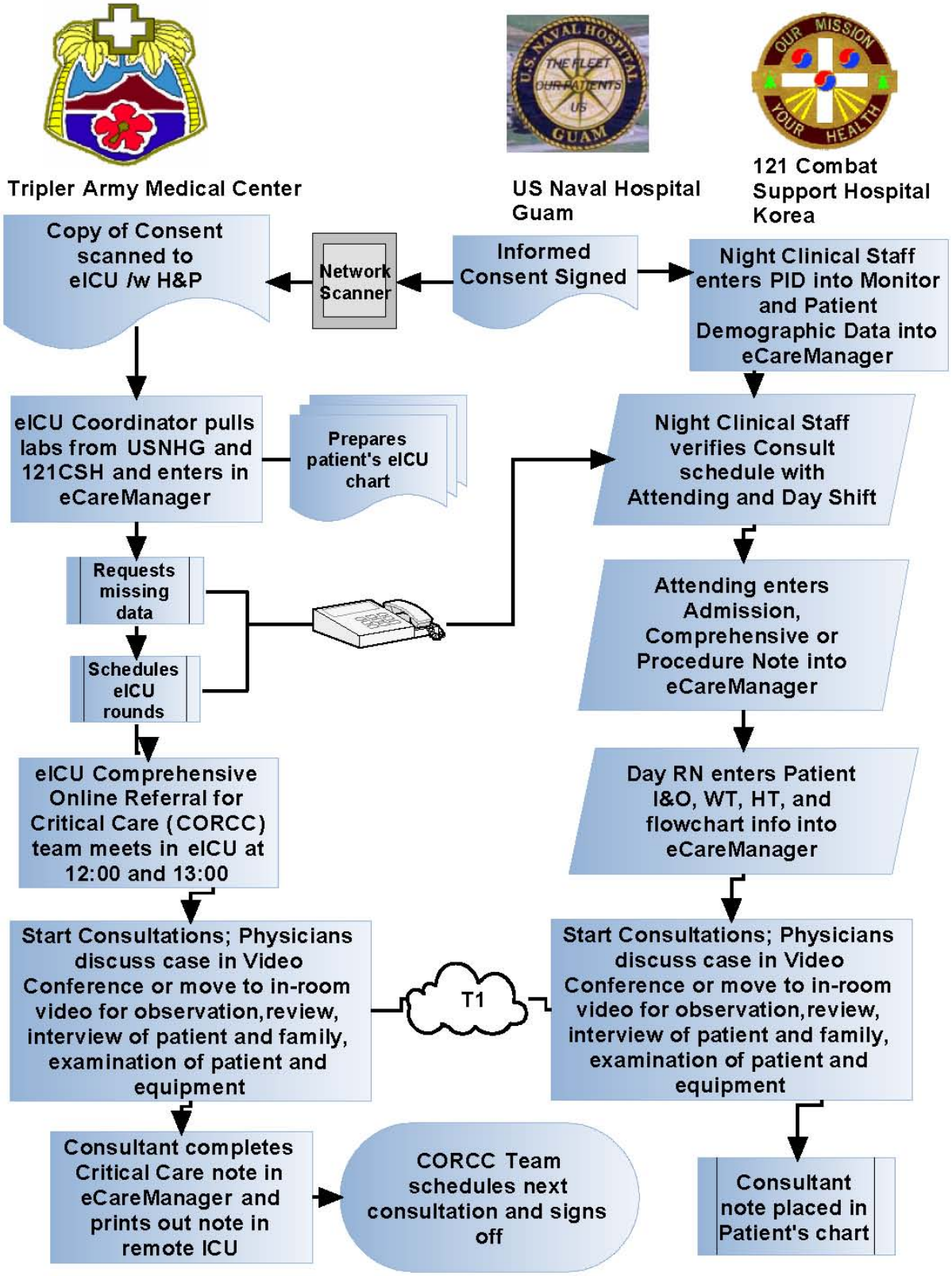
Entering Essential Clinical Information

An effective eICU consultation should also include the following clinical information entered into eCareManager:

- Care Plan with active therapies and supportive care information entered
- Flow sheet with input and out and temperature information entered
- Ventilator settings corresponding with blood gas draws and values
- Updated medications

Access to daily X-Ray information is also required

Figure 15.1.1 eICU Workflow



16 eICU System Operation

16.1 Trouble Shooting: What to do when the system is not working

Most problems with the eICU system operation are related to connectivity. Loss of system connectivity can be attributed to software and/or hardware. Contact the eICU coordinator to report problems with the system as soon as possible. Patient consultations can be completed with little or no eICU functionality by using conventional means of communication.

How to report problems with system function

The eICU coordinator is available 24 hours, seven days a week by digital pager. VISICU, the system vender also provides 24 hour, seven days a week helpdesk support for the system. See figure 5.3.1 for contact information.

Common connectivity problems associated with software.

Most software connectivity problems are related to expired user passwords and are usually identified as such by system messages. When a user receives an expired password message, he or she can contact either an eICU super user or the eICU coordinator to have their password reset. Sometimes loss of system function is related to an expired system password. In these cases the user will be unable to use certain system programs and will receive a system error message. All system error messages should be reported to the eICU coordinator as soon as possible.

Common connectivity problems associated with hardware.

Most hardware connectivity problems are associated with hardware components that have become lose or disconnected from the rest of the system. When a user suspects a hardware related problem he or she should contact the eICU coordinator to assist in locating the problem.

Completing patient consultations without eICU functionality

Patient consultations can be completed with partial eICU support by using conventional communication systems. All TAMC consultants are available by telephone and will provide assistance using the phone combined with functional eICU components.

Table 16.1.1 eICU Helpdesk Support

Contact	Title	Pager #	Office #
Steven Sellner	**eICU Coordinator**	(808) 577-1595 (24/7) DSN 433-3627	(808) 433-2858 DSN 433-2858
Ms. Laurie Kalleberg	**121CSH eICU Liaison**		
LCDR Bob Krejci	**USNHG Division Officer**		(671) 344-9447
	VISICU Helpdesk		(877) 374-2872 (24/7)

Fig. 16.1.2 Trouble Shooting Video Problems

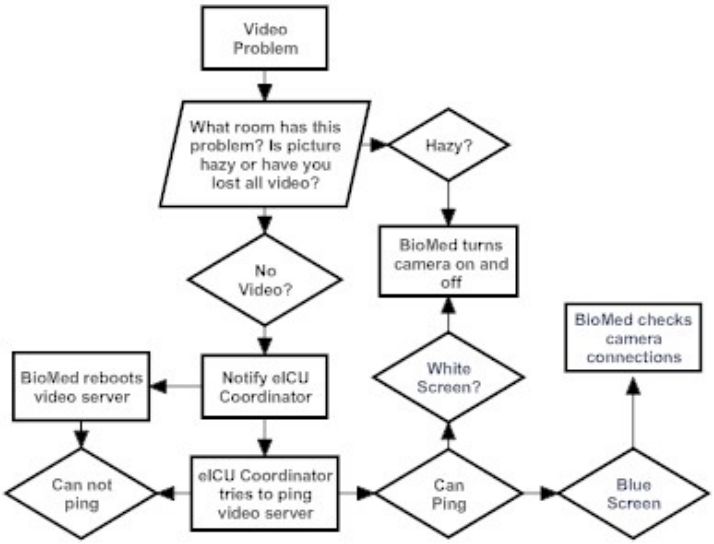


Fig. 16.1.3 Trouble Shooting Audio Problems

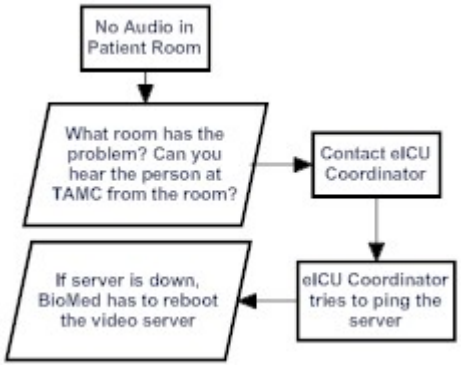


Fig. 16.1.4 Trouble Shooting Conferencing Problems

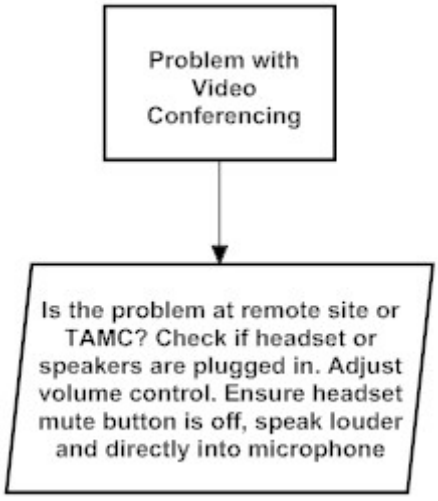
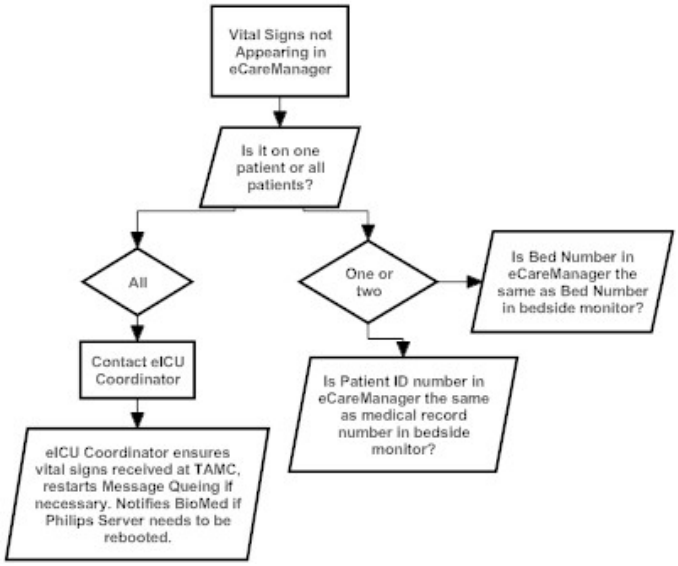


Fig. 16.1.5 Trouble Shooting Trending Problems



17 eICU System Operation

17.1 Emergent eICU Consultation and Management

The eICU is available for scheduled consultations only. If there is an Emergent need for medical support at the remote location, emergency telephone support is available by calling the TAMC "DOCS" line. The DOCS line can be reached 24/7 at DSN 433-DOCS or DSN 433-3627 or (808) 433-3627.

Emergent eICU Consultation

Emergent medical support is available 24/7 by calling the switchboard at TAMC – DSN 433-DOCS. After the emergent medical situation has been resolved, the specialist on-call can schedule a follow up eICU consultation for a more detailed analysis of the patients' medical and clinical needs.

Emergent Telephone Support

Medical Specialists at TAMC are available for emergent telephone support on an on-call basis. On-call physicians can be contacted by calling the main hospital switchboard at (808) 433-6661, (808) 433-6662 or (808) 433-6663 and requesting that an appropriate specialist be paged from the on-call list. Remote physicians can also **call 433-DOCS on their DSN line to reach the TAMC switchboard.** TAMC will confirm the emergency and at a minimum request the following information:

- **Name of caller**
- **Rank of caller (if applicable)**
- **Unit of caller**
- **Location of unit (state/country)**
- **Details of emergency (as thorough as the situation allows)**
- **Date/time of call**
- **Type of provider/support requested**
- **Phone number of caller (means to immediately call back if disconnected including country code or DSN if applicable)**

TAMC will then keep the requesting caller on the line, contact the appropriate staff specialist, and then connect the caller to the staff specialist based on the following progressions:

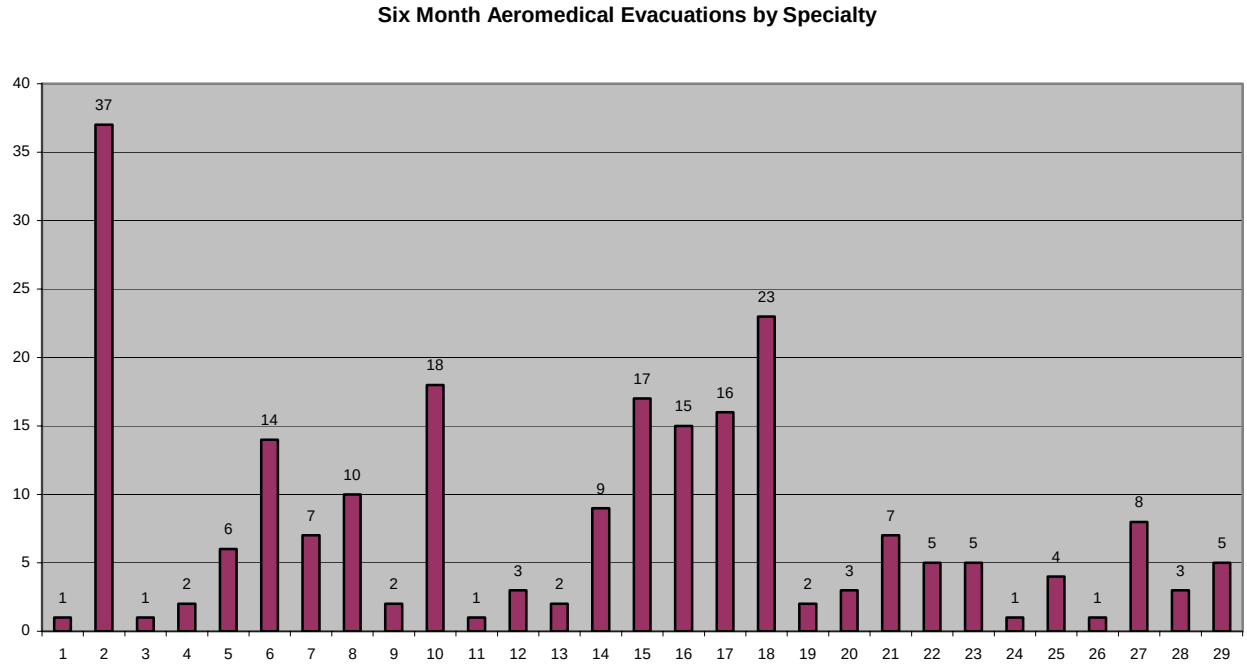
- **On-call roster (appropriate staff physician)**
- **If the on-call roster is not working, contact the appropriate staff physician from the OIC Emergency Contact Roster.**

Emergent Aeromedical Evacuation Support

The 374th Aeromedical Evacuation Squadron at Yokota Air Base, Japan, works with the Aeromedical evacuation element of Hickam's 15th Aerospace Medicine Squadron. to evacuate patients. When Yokota officials receive an emergency tasking, they first identify a hospital that can treat the patient. Next, they call the Tanker Airlift Control Center at Scott Air Force Base, Ill., to locate the closest available aircraft. Finally, they call the Hickam office, which at that point takes over arranging the mission. With assistance from reserve flight nurses and medical technicians, they care for in-transit patients while on the ground at Hickam and arrange ambulances between the flight line and TAMC. Every two weeks, they manage the "retro" mission, a C-141 delivering patients and borrowed medical equipment back to their home bases in the Western Pacific. Although the large C-141s are the primary aircraft used to ferry patients across the ocean, any aircraft will do for urgent

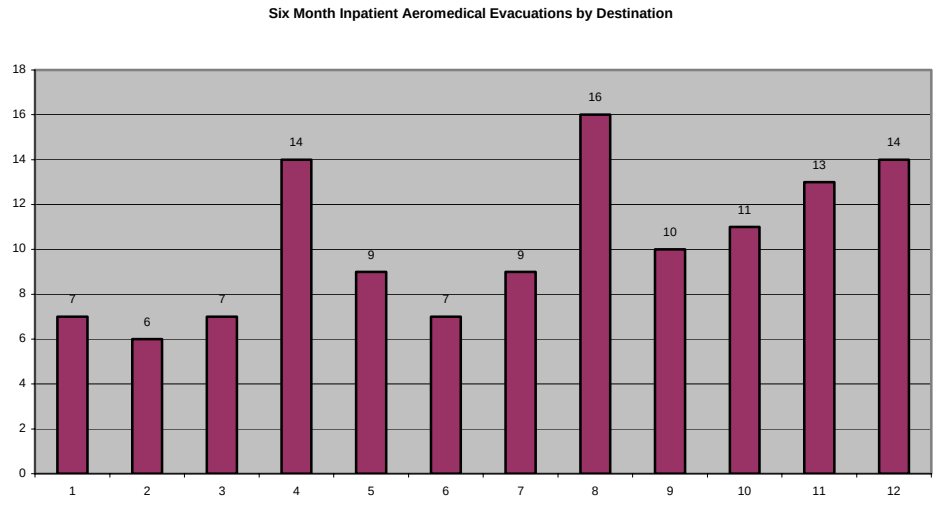
medical evacuations. In 2003 there were four scheduled and 23 emergent Aeromedical Evacuations between NHG Guam and TAMC ICU.

Fig.17.1.1 Six Month Aeromedical Evacuations to TAMC by Specialty



1	Audiology	9	Gynecology	16	Obstetrics	23	Pulmonary
2	Cardiology	10	Oncology	17	Ophthalmology	24	Radiology (MRI)
3	Debilitative Care	11	Infectious Disease Interventional	18	Orthopedics	25	Rheumatology
4	Dermatology	12	Radiation	19	Pain Clinic	26	Sleep Medicine
5	Endocrine	13	Nephrology	20	Pediatric Develop.	27	Spine
6	Ear, Nose, Throat	14	Neurology	21	Plastic Surgery	28	Urology
7	General Surgery	15	Neurosurgery	22	Psychiatry	29	Vascular Surgery
8	Gastrointestinal						

Fig. 17.1.2 Six Month Inpatient Aeromedical Evacuations to TAMC by Destination



1	Labor & Delivery
2	Neonatal ICU
3	Pediatric ICU
4	Critical Care
5	ICU
6	Psychiatry
7	Oncology
8	Medical/Surgical
9	Debilitative Care
10	Pediatrics
11	Medical Patients
12	Surgical Patients

18 Training

18.1 eICU Program Training Plan

The eICU training plan will identify system user ambivalence and reinforce system compliance by correcting misconceptions and establishing target goals for future performance. System benefits will be highlighted and risk mitigation will be reinforced.

Training Staff

The eICU Medical Director is Dr. Eric Crawley. The Training Coordinator is Steven Sellner. Training implementers include LCDR Bob Krejci, USNHG and Ms. Laurie Kalleberg, 121CSH Korea.

Skills Needed

eICU personnel require the following skills:

- Familiarity with procedures, regulations, and practices involving working at their respective remote locations.
- Understanding of eICU improvement practices used at remote sites as identified in the Training Plan
- Understanding of the eICU system and interfaces
- Familiarity with the eICU Support equipment and operation
- Understanding of project processes based on specific job assignments

Training Requirements

eICU personnel are required to complete the following hands on eCareManger training with the eICU Coordinator:

- Understanding of the eICU and interfaces
- Familiarity with the eICU equipment and operation
- Understanding of eICU processes based on specific job assignments
- Specific skill requirements by person as shown in **Table 1.1.1**

Table 18.1.1 Training Objectives

Section	eCareManager Task	Procedure	Designated Personnel	P/F
Login	Log into eCM and the view the Home page	Click the eCareManager link	All	
		View Hospital facility and expand beds to view patient room assignments		
ADT	Admit a new patient	Right click on empty bed or expand ADT functions at bottom of screen	US, RN, MD	
		Enter first, last name		
		Enter PID that matches medical record number from monitor		
		Expand provider list and select attending		
		Enter DOB, gender, height and weight and select, "Admit Patient"		

Profile	View Patient Profile	Double click on Patient/Bed from census page	All	
	Note "Buttons" for Record Sections			
Care Plan	View/Update Patient Care Plan	Select care plan button	RN	
		Designate managing physician with "Modify Care Providers" link		
		Adjust acuity level		
		Select "Ordered Protocols" and update		
		Designate "Code Status" care limitations		
		Update ventilator status in "Active Therapies" section		
		Update DVT prophylaxis in "Active Therapies" section		
		Click "Save/Validate & Print in ICU" and place care plan on chart		
Task List	View/Update Patient Task List	Select "Task List" from top of patient screen	US, RN	
		Add new tasks for completion and designate priority		
Orders	Meds-Update/Medications	Enter current medications	MD, RN	
	Orders-Create	Create, save and print new medication order and fax to pharmacy	MD	
Laboratory	Add new lab results	Click on "Laboratory" button and select appropriate category	RN	
		Select "Add", provide new order number and enter lab values		
		Save new values when finished		

Flow sheet	Add new VS and Infusions	Select "Vital Signs and Infusions" tab on Flow sheet	RN	
		Click "Add Column" button		
		Enter GCS by expanding …		
		Enter Pain Score/Goal		
		Enter a new Continuous Infusion		
		Import VS and enter VS not automatically added		
		Note VS and Infusions can be imported from previous shift		
		Save new values when finished		
	I & O	Select "I&O" tab on Flow sheet	RN	
		Click "Add Column" button		
		Enter total input and output items in respective columns		
		Note previous values can be imported from previous shift		
		Save new values when finished		
	Nursing Assessment	Select "Nursing Assessment" tab on Flow sheet	RN	
		Click "Add Column" button		
		Enter "Scores" by expanding …		
		Note previous values can be imported from previous shift		
		Save new values when finished		
	Nursing Care	Select "Nursing Care" tab on Flow sheet	RN	
		Click "Add Column" button		
		Enter "Scores" by expanding …		
		Note previous values can be imported from previous shift		
		Save new values when finished		

Notes Create	Admission Note	Select "Admission" from Notes Create page	MD	
		Change "user type" if applicable		
		Enter Admission Diagnosis for APACHE III		
		Complete narrative for patient description, HPI and significant events		
		Note addition of additional screens: Allergies, Systems Review, etc.		
		Proceed to next section - Past History		
		Complete using drop down menus		
		Proceed to next section - Physical Exam		
		Note VS automatically imported		
		Note GCS must be completed in "Neurological" section		
		Proceed to next section - Objective Data		
		Note Labs automatically entered		
		Proceed to next section - Active Problems/Diagnosis		
		Note each problem/Dx provides for comments in next section		
		Save new problems/Dx and proceed to Assessment and Plan		
		Complete free text treatment plans for each problem/Dx		
		Proceed to last screen and view note		
		Enter PIN and Save/Print note for inclusion in patients chart		
	Comprehensive and Brief Note	Follow same sequence as for Admission Note	MD	

19 Operational Record

19.1 Lessons Learned

The eICU's success can be based on the saving of just one life. Unfortunately the Department of Defense requirement for increased security has limited the use of eCareManager, the eICU's robust medical and clinical interface. To remedy this situation the eICU program provides for an eICU Liaison who can support the additional operational activities of the eICU until system integration can be accomplished. With a 587% return on investment, the eICU program can and should provide this critical operational support.

19.1.1 The main purpose of the eICU is to save lives

Since the initial consultation on June 19th 2003 there have been a total of 205 eICU consultations on 80 patients. Eleven of those consultations resulted in what was considered to be a "saved life." There is no practical way to place a "value" on a "saved life." While most people would agree that a person's life is priceless, those who have attempted to measure such value have used an average of $5 million for each saved life. That would mean the eICU is worth at least $55 million. If we spent $2 million a year to upgrade and maintain the eICU for four years, that would be $8 million or over 587% return on our investment.

19.1.2 There are four "Hard Factors" that contribute to the success of the eICU program: 1) Project duration, 2) performance integrity, 3) commitment of senior government personnel and 4) the additional effort of medical and clinical personnel needed to fulfill eICU requirements

19.1.2.1 Project duration

It has been six and one half years since the eICU program began in April of 2001. During this period, there have been several periods of inactivity due to lapses in funding and related technical issues. This combined with the transient nature of government personnel both at Tripler Army Medical Center, Naval Hospital Guam and 121 Combat Support Hospital Korea has made regular project assessments difficult with loss of continuity. eICU objectives were often forgotten and needed to be restated. Project champions would transfer to other facilities and those remaining would lose their enthusiasm. To remedy this, the eICU program was reviewed frequently to restate project initiatives and establish new milestones for the next project phase.

19.1.2.2 Performance integrity

The eICU program has combined the expertise of over eight different project teams. These teams included, information systems engineers, telehealth and communications vendors, government project management, medical and clinical personnel and medical school investigators. Coordinating these different interests has been rewarding and challenging.

19.1.2.3 Commitment

The eICU has been visited by many distinguished military and government leaders without whose unwavering support, the program would not have been possible. The commands of TAMC, USNHG and 121CSH have joined to support a tri-service project to improve the medical treatment of active military personnel, veterans and their families. As mentioned above the commitment of medical and clinical staff has been adversely affected by frequent transfer of key eICU champions. To address this issue, the role of eICU liaison was identified with placement at the remote eICU medical facilities.

19.1.2.4 Effort

The amount of additional effort needed by medical and clinical personnel to establish and perform their eICU duties is of primary importance to the success of the project. In the case of the eICU there is a requirement to comply with special security procedures associated with Department of Defense information systems. This is a requirement that, due to cost and time factors, has necessitated the eICU be completely isolated from the DoD's information infrastructure. This has created a situation where the "production" medical and clinical record can not be integrated into the eICU's robust clinical interface. To prevent remote medical and clinical personnel from diverting "mission critical" treatment interventions towards redundant documentation, the eCareManager application has not been fully utilized. This results in many of the treatment tracking and improvement features of this robust interface not being available to assist the remote medical and clinical personnel in their goal of improving patient outcomes.

19.1.3 All Medicine is Local – Computer Supported Social Networks and Community of Practice

Ordinarily it would be quite natural for a physician to consult a critical care specialist regards the special care of his or her patient. The critical care "expert" would provide a "shortcut" to specialized knowledge the internist or family practice physician would take years to acquire through advanced study and supervised experience. However, in the case of the eICU where the remote physician is separated by thousands of miles and a different day and time, the tendency is to "go it alone" or consult with local peers.

Assuming that the eICU represents a form of 'Computer Supported Social Network' between our respective organizations, there is some evidence that the extent to which such networks are integrated into each organization affects the participation in that network. In terms of 'communities of practice (CoP),' Tripler, Naval Hospital Guam and 121 Korea have their established experts; the repertoire of its communities of practice is sustained through the dynamic interplay of what is referred to as 'duality of participation and reification.' When discussing communities of practice, participation refers to how we engage together in an activity, and through that engagement generate, affirm and replicate patterns of engagement: our practices. Reification refers to ways in which these practices become reflected in artifacts and other structures that help replicate the practices. For example, the practices of an ICU department are reflected in the structure of its procedures and forms. This structure supports replication of those practices in the moment by reminding participants of what they need to do, and in the long term by serving as a guide through which new members of a CoP can be brought into its specialty. Reifications of practice are not restricted to physical artifacts and information technologies. Terminologies, ways of talking, conventions of social greeting, etc. can also serve as reifications of practice. Importantly, participation that engages reification is not just controlled and constrained by that reification, but also reaffirms and sustains the meaning of the reification, and can change the meaning of (reinterpret) the reification.

Unfortunately in our situation, the eICU is completely separated from the established participation and reification of both Naval Hospital Guam and 121 Korea's production clinical information system and does not benefit from the dynamic interplay normally associated with an established CoP. This arises in conjunction with the issue of maintaining separate networks until a "DIACAP" (DoD security requirements) required integrating the information systems is completed. Non-participation can be expected (not necessarily tolerated) in this situation and probably will not improve until there is better integration of the eICU with Naval Hospital Guam and 121 Combat Support Hospital's operational patient information system.

20 Operational Record

20.1 eICU Program Demographics

The eICU serves patients of all ages. Most patients are active duty or dependents; the eICU is also available for use with civilians on an emergent basis.

20.1.1 Who are the Patients?

Total Patients Enrolled:

As of October 15th 2007 – 128

Figure 20.1.1 Ages of Patients

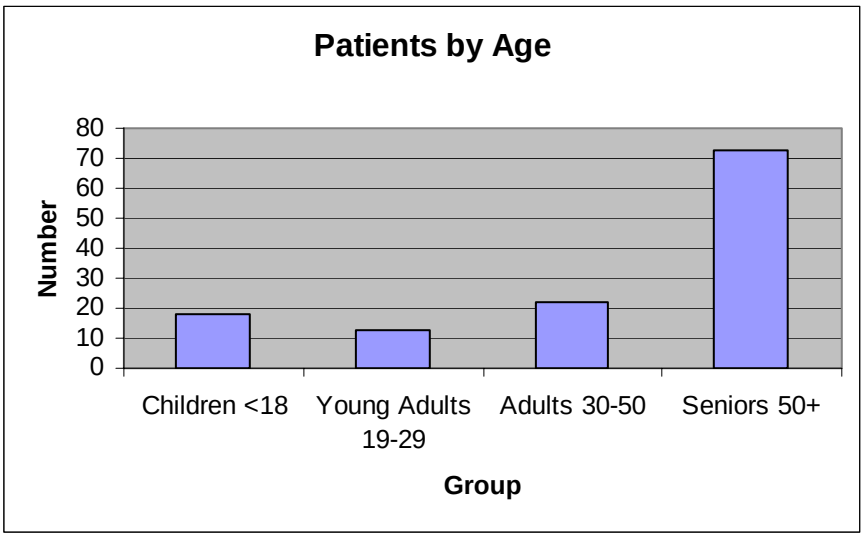


Figure 20.1.2 Active Duty, Dependents, Other

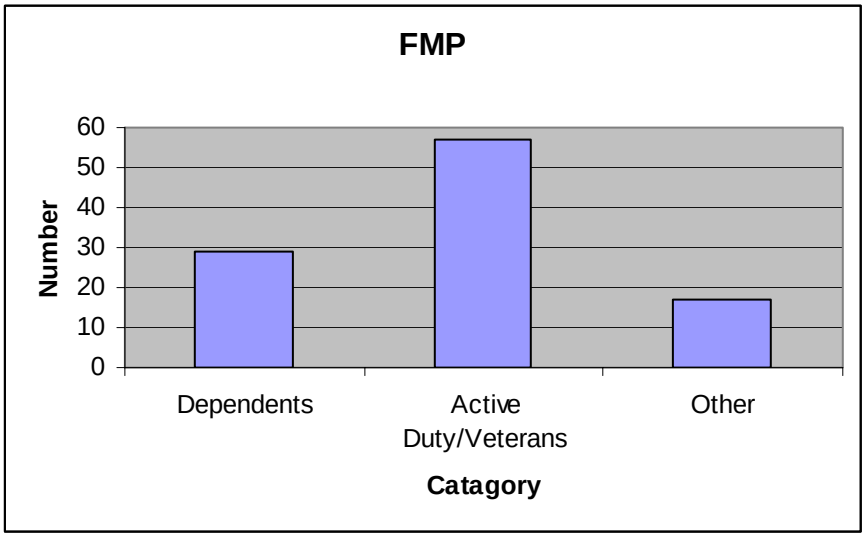
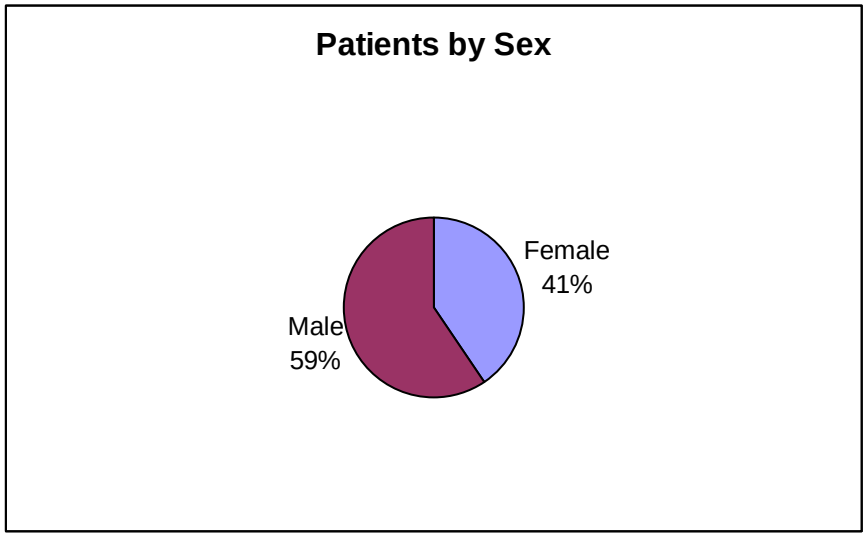


Figure 20.1.3 Patients by Sex



20.1.2 Consultations

Since June 19, 2003 there have been a total of 205 eICU Consultations

Figure 20.1.4 Consultations by Diagnosis

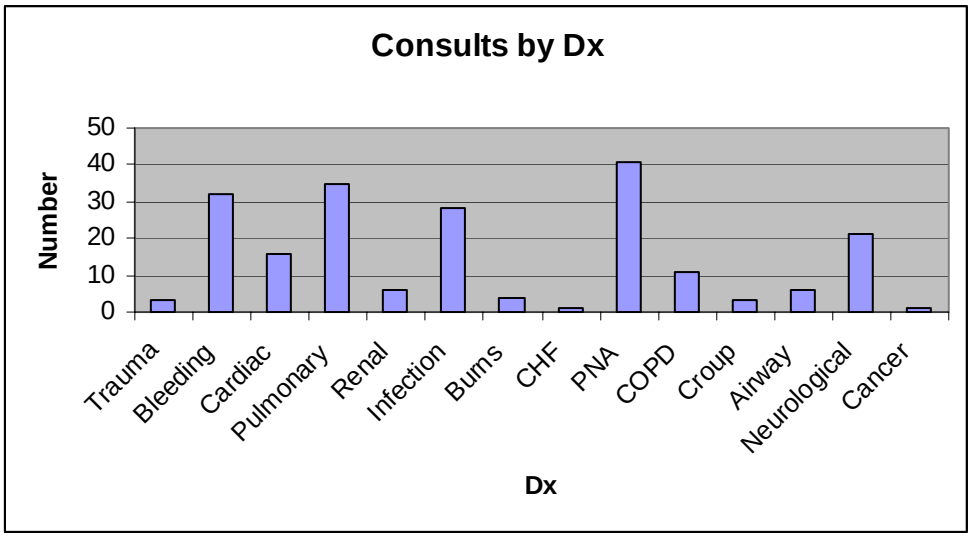
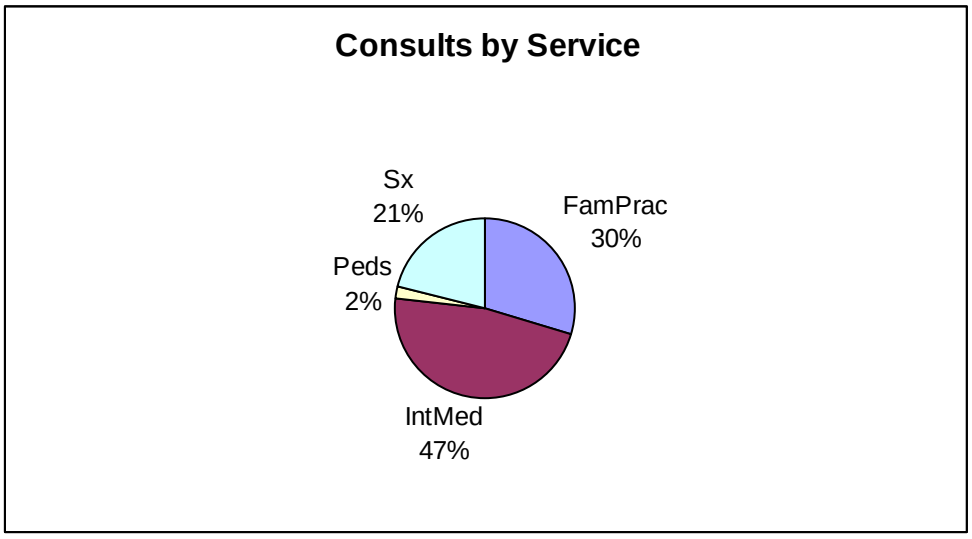


Figure 20.1.5 Consultations by Service



21 Appendix A

21.1 Figures and Tables

22 Appendix B

22.1 Common Acronyms used in this Document

121CSH	121 Combat Support Hospital Korea
ACLS	Advanced Cardiac Life Support
ARDS	Acute Respiratory Distress Syndrome
CHCS	Composite Health Care System
ChST	Chamorro Standard Time
COTR	Contracting Officer Technical Representative
COTS	Commercial off the Shelf
CT	Computer-aided Tomography
DLT	Digital Linear Tape
DoD	Department of Defense
DoM	Department of Medicine
DSN	Defense Switched Network
EEG	Electrocardiograph
eICU	Electronic Intensive Care Unit
FDA	Federal Drug Administration
HIPAA	Health Insurance Portability and Accountability Act of 1996
HST	Hawaii Standard Time
ICU	Intensive Care Unit
IMD	Information Management Division
IMDTD	Information Management Division Telemedicine Division
IMMPACT	ICU Multipoint Military Pacific Consultation using Telehealth
ISDN	Integrated Services Digital Network
JCAHO	Joint Commission on Accreditation of Health Care Organizations
LAN	Local Area Network
LCD	Liquid Crystal Display
LDHCEMB	Logistics Division Healthcare Equipment Management Branch
LOS	Length of Stay
MEDCEN	Medical Center
MHS	Military Health System
MOU	Memorandum of understanding
MPLS	Multi Protocol Label Switching
MTF	Military Treatment Facility
NHG	U. S. Naval Hospital Guam
PID	Patient Identification Number
PVC	Permanent Virtual Circuit
RAMS-CC	Remote Access to Medical Specialists – Critical Care
RMD	Resource Management Division
SSN	Social Security Number
TAMC	Tripler Army Medical Center
TATRC	Telemedicine and Advanced Technology Research Center
ToTo	eICU “Turn On/Turn Off” Technology Assessment
USAMRMC	U.S. Army Medical Research and Materiel Command
VAMROC	Veterans Affairs Medical Regional Office Center
VPN	Virtual Private Network
WAN	Wide Area Network

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APPENDIX
A-4

TRIPLER ARMY MEDICAL CENTER

>>>>NEWS RELEASE<<<<

For Immediate Release

For more Information, contact the TAMC Public Affairs Office at (808) 433-5785 or TAMCPublicAffairsOffice@amedd.army.mil

Dec. 5, 2006

Joint effort, team work plays key role, injured Sailors receive top-notch care

Story by Mindy Anderson, Tripler Public Affairs Office
Photos by Col. Richard Stack

This image shows three of the six bays set-up in preparation to receive the six injured Sailors. Equipment is combined TAMC and B-SMART team. The green boxes on the floor are the B-SMART monitors and black frames that support all the monitors, IV pumps, suctions, and other support equipment. These black metal frames attach directly to the NATO stretchers for transport.

Honolulu, HI. -- At 2:45 a.m. Friday, Tripler Army Medical Center (TAMC) received a call reporting a steam leak onboard the USS Frank Cable in Guam.

Six Sailors with serious burns (five ventilator-dependent) were sent to the U.S. Naval Hospital in Guam for initial stabilization. These Sailors arrived at TAMC at 6 a.m. Saturday and were met by the Burn Special Medical Augmentation Response Team (B-SMART) who deployed from Brooke Medical Army Center (BAMC), Fort Sam Houston, Texas.

The nine-member B-SMART was comprised of the military's leading experts in

-more-

the field of burn trauma, and arrived in Hawaii midnight Friday.

"Before arriving it was proposed that we go to a civilian burn unit in Hawaii, but we stressed we wanted to be in a military setting since we were dealing with military personnel and the Department of the Army Logistics System – we knew it would run smoother," said Col. David Barillo, officer-in-charge, B-SMART, BAMC. "Personnel at both Tripler and Hickam Air Force Base gave 1,000 percent care toward the patients when they arrived."

The B-SMART officer-in-charge said the effort at Tripler was absolutely incredible – anyone who could remotely help was offering to help.

"People called throughout the time we were there offering to come in and help," Barillo said. "We brought enough equipment for the six burn victims, but we were able to set-up a six-bed burn trauma area in the Tripler Patient Acute Care unit because Tripler staff had everything set-up – IV fluids, narcotics, bandages – every thing we needed was provided.

10 minutes after taking the image at Top Left, the PACU was filled. In fact, more support personnel assisted after the initial assessments to intervene and assist as needed throughout the day. Pace was extremely high and didn't stop.

The healthcare professionals at TAMC worked closely with the burn trauma experts of BAMC to ensure the Sailors received the best care available as quickly as possible.

"TAMC and [B-SMART] staff worked as a team with each patient -- true support partnership in every sense," said Col. Arthur Wallace, deputy commander for

-more-

nursing, TAMC. “Command Sgt. Maj. [Joel Jenkins, TAMC] provided runner support. Nutrition Division support is provided breakfast, water, and break room snacks for all. Radiology staff was on stand-by for portables. Residents, nursing staff, and support staff provided extra arms for lifting, assistance with IV pumps, shaving, wrapping with silver wrap dressings, etc,” Wallace reported.

TAMC’s Chaplain (Lt. Cmdr.) Robert Fuehrer, TAMC Navy Chaplain provided support and assistance to the injured Sailors and the two families who accompanied the patients to Hawaii.

“It was such a privilege to be a part of a joint effort such as this,” Fuehrer said. “It didn’t matter what we were wearing, Fuehrer said. “It’s ONE TEAM, ONE FIGHT, working together for the health and welfare of Soldiers, Sailors, Airmen and Marines was such an honor,” he said.

After the patient has been fully prepared and stabilized for transport with the B-SMART team, the metal support is fixed to the NATO stretcher supporting the monitors, electronic IV pumps, suction, and fluids/IV medications required to treat and stabilize for the expected nine-hour flight. We supplied the team with enough albumin, IV fluids, and medications for three days, which is the practice just in case they have to land before the final destination and the local medical support is not robust.

Fuehrer spoke with the one patient who was ambulatory, and he said the patient seemed pleasantly surprised when he walked through the door.

“I think it brightened his spirits that a Naval Chaplain walked through the door in an Army medical facility,” Fuehrer said. “Being available to the Navy personnel provided a sense of comfort and familiarity that further bridged a gap

-more-

between the service."

Col. Richard Stack, surgeon, TAMC, credited everyone involved with phenomenal professionalism and teamwork.

"When the Sailors first arrived in the PACU, we had people from the Army burn team, our Tripler team, the team from the Navy Hospital in Guam, the Air Force Critical Care Air Transport Team, and GS civilians all working together with only one mission in mind – to save the lives of these Sailors, and it didn't matter who you were," Stack said.

So many pieces came together to make this mission a success.

According to Stack, Straub Clinic and Hospital loaned Tripler Silverlon bandages which enhanced the treatment of the burn wounds. In addition, he said they called twice during the day to see if we needed any additional items or assistance

"Pharmacy was hopping," Stack said. "Normally closed on weekends, they set-up and staffed the nearby satellite pharmacy with dedicated assets for this mission. Up to three pharmacy personnel were required at one time due to the high demand," he said.

Wallace reported Tripler's Anuenue Café delivered food to the adjacent break area for the team including cold water and juice. The water and juice, along with Red Bull, were consumed at high amounts due to the elevated temperature of the room which was done to decrease lost body temperature by the burn patients, a significant issue in burn patients.

There were other supporting factors that played a role in the success of this mission.

"Tripler Facilities Management increased the room temp before the Sailors arrived and also three operating rooms if surgery was required; IMD configured all the phones in the PACU to enable contact with Guam, the mainland, just everywhere," Stack said. "We could have called God if we had wanted to – that's how efficient it was," he said.

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4-4-4
SAILORS

Additionally, the planning and coordination played a significant role.

As soon as TAMC was aware of what happened, the planning and coordination began. Key players met at 11 a.m. Friday morning and again at 4 p.m. to make sure all coordination had been made, Stack said. One of the key pieces that helped TAMC prepare was the Electronic ICU. TAMC had telemedicine, video, and monitor review of the Guam ICU at TAMC – “We could view these patients until they left for transport from Guam to Hawaii,” Stack said.

By all accounts this was a hugely successful joint mission and a morale booster for all involved.

“The teamwork displayed by all parties involved contributed significantly to the success of this well coordinated life saving mission,” said Col. Derick Ziegler, chief of staff, TAMC. “Most importantly, this well coordinated joint effort by all involved resulted in these severely injured Sailors getting the necessary superb life sustaining medical care. A special thanks goes to Col. [Richard] Stack, our surgeon-in-charge, for making the coordinated effort seamless and professional,” Ziegler said.

Stack concluded the integrated multiservice multidisciplinary teams worked so well together that you would have concluded they had been working together for years.

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IMMPACT
FINAL REPORT 2010

APPENDIX
A-5

Clinical Care, Technical Factors, Research Findings and Conclusions

I. Clinical Care

This project delivered critical care consultation from TAMC (HI) to NHG (Guam) and BAACH (Korea). The hub and spoke model of real-time consultation utilized the VISICU eICU® system. The system has been extensively described in prior quarterly and annual reports. Key metrics and conclusions regarding the clinical care delivery system are provided below.

Consultation activity:

During the 4 year period of this award a total of 264 discrete consultation events were completed. This is similar to utilization rates seen in the intervals of eICU operation from inception in 2003 to the 2006 initiation of this projects reporting period. A total of 132 patients received consultation, with full consultation notes entered into the medical record at the remote site. All telepresent providers were clinically credentialed at the remote healthcare facilities for provision of both telehealth and on-site clinical care. Four principal requesting services comprised 97% of the requested consults; Internal Medicine – 80%, Family Medicine – 19%, Pediatrics – 14%, and Surgical Services – 11%. The other requesting services included obstetrics and gynecology, and critical care medicine specialists. Comprehensive census data was not available from NHG or BAACH. Average daily census at the remote ICU locations was 3-4 patients, and average LOS was 2-3 days. Between 5 - 10% of admitted patients in these locations received remote critical care consultation. A number of consultative events were conducted and did not result in completion of a medical record entry. This was principally at the beginning of the program, and included remote reviewing of images by neurosurgery consultants, EKG and rhythm monitoring analysis by cardiology consultants, and others. The majority of patients transferred from a remote ICU to TAMC were managed by remote consultation prior to transfer. Several critically ill patients received lifesaving interventions attributable to telepresence of a critical care specialist. One case involved ventricular fibrillation due to hyperkalemia induced by succinylcholine and another required advanced ventilator strategies including prone positioning and inverse ratio ventilation for refractory hypoxemia and ARDS. These emblematic cases were in young AD or dependent patients. One mass casualty event was supported at NHG by TAMC eICU critical care consultants. A boiler room explosion resulted in severe burns and inhalation injury in multiple victims. The average census of the ICU was more than tripled, the necessary resources strained the capacity of the hospital, and the severity of illness for multiple patients was much greater than usually encountered. The eICU provided real-time critical care and surgical consultation from the time of victim arrival in the GNH ICU until time of aeromedical evacuation to Tripler Army Medical Center. The safe transport and continuity of care for multiple burned and ventilated patients was facilitated through ongoing communication and

management coordination using the eICU system. This episode highlights the contingency capacity function of the remote critical care system.

Consultation Workflow:

Remote critical care consultation during this project was provided at request of the primary provider. The eICU coordinator at TAMC made daily telephonic contact with ICU staff to review patient census and diagnoses, and proactively determine if any daily critical care consultation requests required provider coordination. Consultations were managed by TAMC critical care specialist physicians, assigned to the ICU attending service. Time zone differences facilitated favorable timing of scheduled consultation rounds. The TAMC eICU is physically co-located with the ICU, enabling timely responses to eICU consultation requests, and frequent follow up as clinically required (see Figure 1).

FIGURE 1

eICU Workflow Schedule

Tripler Army Medical Center eICU Program							
HAWAII Time	Mon TAMC eICU	Tue TAMC eICU	Wed TAMC eICU	Thu TAMC eICU	Fri TAMC eICU	GUAM Time	KOREA Time
9:30-10:00	EICU Coordinator Telephones Korea for Consultation Schedule	EICU Coordinator Telephones Korea for Consultation Schedule	EICU Coordinator Telephones Korea for Consultation Schedule	EICU Coordinator Telephones Korea for Consultation Schedule	EICU Coordinator Telephones Korea for Consultation Schedule	5:30-6:00	4:30-5:00
10:00-10:30	Night Shift RN Enters Patient	Night Shift RN Enters Patient	Night Shift RN Enters Patient	Night Shift RN Enters Patient	Night Shift RN Enters Patient	6:00-6:30	5:00-5:30
10:30-11:00	Night Shift RN Enters Clinical Data	Night Shift RN Enters Clinical Data	Night Shift RN Enters Clinical Data	Night Shift RN Enters Clinical Data	Night Shift RN Enters Clinical Data	6:30-7:00	5:30-6:00
11:00-11:30						7:00-7:30	6:00-6:30
11:30-12:00	eICU Coordinator Enters Labs	eICU Coordinator Enters Labs	eICU Coordinator Enters Labs	eICU Coordinator Enters Labs	eICU Coordinator Enters Labs	7:30-8:00	6:30-7:00
12:00-12:30	Attending Enters Medical Data	Attending Enters Medical Data	Attending Enters Medical Data	Attending Enters Medical Data	Attending Enters Medical Data	8:00-8:30	7:00-7:30
12:30-13:00	Day RN Enters I&Os	Day RN Enters I&Os	Day RN Enters I&Os	Day RN Enters I&Os	Day RN Enters I&Os	8:30-9:00	7:30-8:00
13:00-13:30	Consultation	Consultation	Consultation	Consultation	Consultation	9:00-9:30	8:00-8:30
13:30-14:00	Consultation	Consultation	Consultation	Consultation	Consultation	9:30-10:00	8:30-9:00
14:00-14:30	Consultation	Consultation	Consultation	Consultation	Consultation	10:00-10:30	9:00-9:30
14:30-15:00	Consultation	Consultation	Consultation	Consultation	Consultation	10:30-11:00	9:30-10:00
15:00-15:30	Consultant Enters Consult Note	Consultant Enters Consult Note	Consultant Enters Consult Note	Consultant Enters Consult Note	Consultant Enters Consult Note	11:00-11:30	10:00-10:30
	Tue USNHG ICU / 121SCH ICU	Wed USNHG ICU / 121SCH ICU	Thu USNHG ICU / 121SCH ICU	Fri USNHG ICU / 121SCH ICU	Sat USNHG ICU / 121SCH ICU		

Utilization of protocolized criteria for mandatory critical care consultation was encouraged and criteria were developed by consensus with participating remote ICU's. These "automatic referral" criteria were integrated into operational documents for the remote ICU's. Use of the

criteria to trigger referral for ICU consultation was not maintained. The criteria were not familiar to newly assigned personnel in either remote site, and were not uniformly presented as part of the ICU orientation for newly arriving physician, respiratory therapy, or nurse practitioners. This aspect of the program was not successful, likely due to high staff turnover rates, and lack of leadership emphasis at the ICU level.

CONCLUSIONS - CLINICAL CARE:

The clinical program was conducted continuously, with minimal interruption of critical care consultation availability. Interruptions were due to scheduled software and hardware upgrades. A comprehensive clinical application assessment was beyond the scope of this pilot project, nonetheless, valuable lessons learned and questions for further research can be formulated. Clinical providers at both the remote locations and TAMC accepted the system as a valuable adjunct to care for patients in the remotely located, low volume, low acuity ICU setting. Benefit was especially appreciated when transfer of patients permitted seamless continuity of care for both nursing and physician providers. Utilization was driven by the primary provider generated consult request, rather than the anticipated criteria driven process. Utilization was increased while a project supported clinical coordinator was assigned at the BAACH site in Korea, and diminished when the coordinator transitioned responsibility for eICU consult management and facilitation to a designated assigned ICU staff nurse. These facts are consistent with known features of telemedicine programs. Clinical benefits and practitioner use in successful programs is accompanied by optimization of human resources and workflow processes that minimize impact on routine care paradigms. Executive support for this program was evidenced as the program became a marquee project for demonstration of the advanced practices at TAMC and the participating remote ICU's. The roster of VIP demonstrations is included in the submitted quarterly reports. Surgeons General of the US Army, US Navy, and US Air Force were amongst the visitors to the TAMC eICU. The project transitioned from a research supported project to an internally funded program. The eICU clinical system is currently internally funded by TAMC and NHG. It is approved for replacement with TAMC funding for an information security compliant remote critical care consultation system after expiration of the current eICU Interim Authority to Operate.

II. Technical Factors

The eICU electronic interface was limited by DoD Information Assurance policies. The system operated on an isolated communications circuit, initially provided by a commercial service provider, and later provisioned by the Tri-Service Infrastructure Management Program Office, a DoD agency. Security limitations precluded full integration of the eICU system with hospital information systems (HIS) at participating facilities. The eICU functionality related to integration of data from laboratory, medical records, pharmacy, and other electronic databases

was not utilized to full capacity. Audio, video, and physiologic streaming signals were enabled, and other information was accessed over secure remote access systems. Duplicate data entry was required due to this limitation. Functional interfaces exist for integration of the DoD HIS that are in current use. Tripler Army Medical Center operated the eICU under an Information Assurance Approved Interim Authority to Operate (IATO), which was renewed once during the course of this program. A VISICU contracted DIACAP feasibility analysis determined that multiple non-compliant features of the eICU system would require major software and hardware re-configuration and programming to establish an eICU product line which could be submitted for DIACAP approval, a Certificate of Networthiness, and ultimately full integration with DoD HIS'. A VISICU determination regarding pursuit of DIACAP certification is deferred at the time of this report.

III. Research

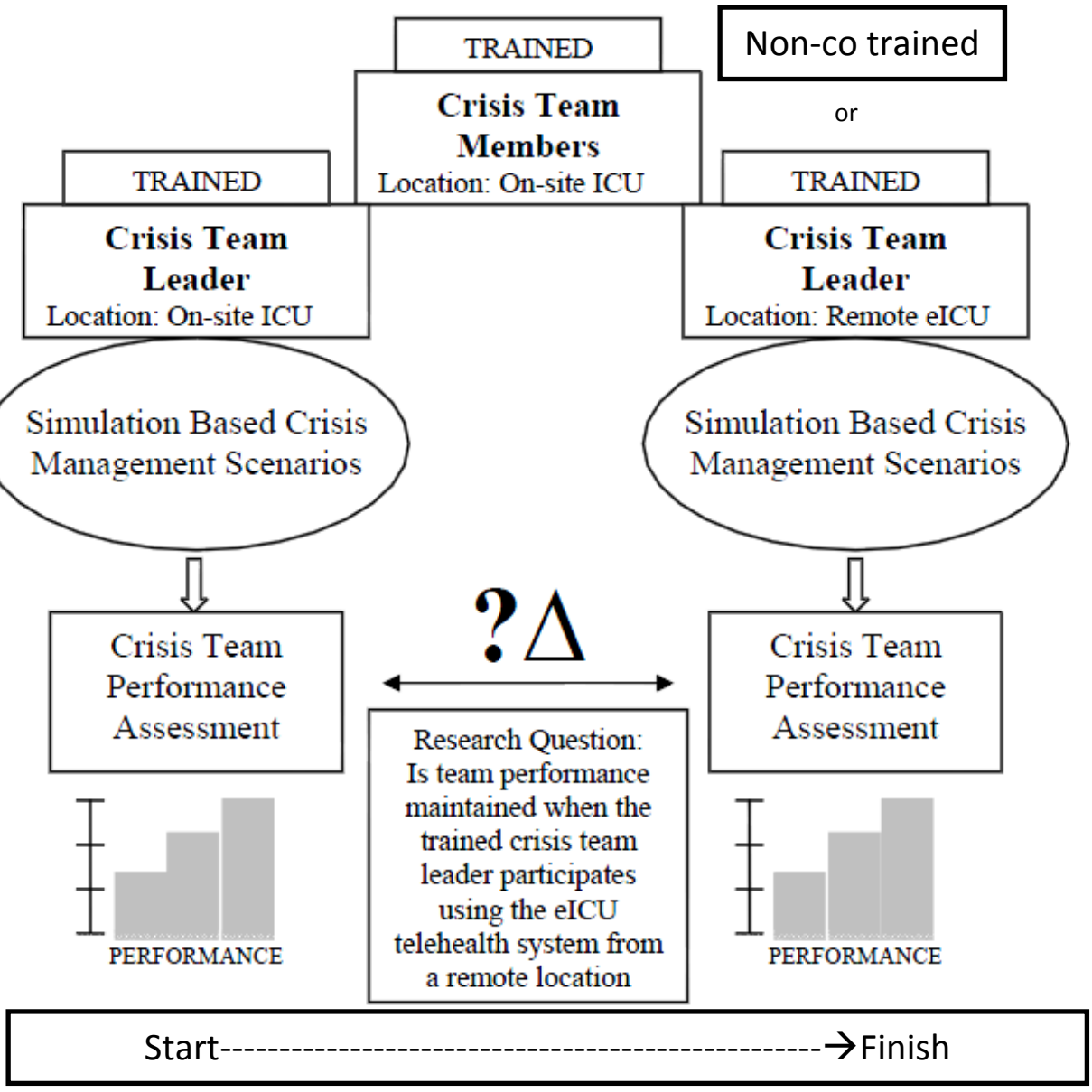
A comprehensive study protocol is not included in this document. It is included in previous submitted quarterly reports.

IMMPACT RESEARCH DATA SUMMARY

Purpose of Study: This study seeks to define if remote physician team-member participation in specialty focused team-trained care delivery is equivalent to on-site participation.

Study Design: The study design is structured to evaluate the impact of on-site versus off-site physician participation on resuscitation/crisis team performance using high fidelity manikin based simulation scenarios; one physician team member was selected for off-site participation during team performance data collection for comparison to team performance with all members located on-site. The off-site participating physician team leader was either A) a "local" ICU assigned physician who underwent crisis team training with an intact team, and then participated in team performance exercises on-site followed by an off-site telepresent leadership role in a repeat of the same exercise, or B) a remotely assigned similarly credentialed physician "foreign" who had not co-trained with the resuscitation team. This model allowed us to examine the model of critical care consultation that was implemented during this project, with a "foreign" critical care consultant providing all consults. See Figure 2.

Figure 2
Study design



Hypothesis:

Phase I
• Multidisciplinary teams will maintain performance metrics when a co-trained physician team member participates in critical care resuscitation scenarios remotely, via the eICU system, compared to performance metrics observed with all team members, including the physician member located on-site.

Phase II
• Multidisciplinary teams will maintain peak performance metrics when a non-co-trained "foreign" physician team member participates in critical care resuscitation scenarios remotely, via the eICU system, compared to performance metrics observed with all team members, including a co-trained physician team member located on-site.

Total data sets: 14 (7 Phase I, 7 Phase II)

Total sample size: 42 unique teams (6 teams per session) consisting of 4 individual critical care healthcare providers (physician, nurses and respiratory therapist) at US Army Hospital in Yongsan, Korea and Tripler Army Medical Center (TAMC) in Honolulu, Hawaii. The total number of simulation scenarios completed for data collection and analysis was 168.

Team Composition: Each team was comprised of one physician, two nurses and one respiratory therapist, so that all individual team members worked at least once with each other.

Phase I Team Training:

Each group participated in 3 practice scenarios. After completing the practice sessions, each team participated in 2 test scenarios (A & B) that were administered in random order. Teams were scored on the test scenarios.

Phase II Team Training:

Within 3 days after the Phase I Team Training, 3 randomly selected groups in each session completed the same 2 test scenarios (in random order) with their original team leader in a remote location, participating over the eICU interface. The remaining 3 groups also did the same test scenarios, but were similarly led remotely by a "foreign" leader (at TAMC) who they had never trained/worked with. Teams were scored based on their performance on the test scenarios.

Timed measurements were completed using the SimMan (Laerdal Inc, Wappingers Falls NY) software package as automatically collected by integrated sensors, or by an operator triggered checklist.

Scenarios:

The two scenarios utilized for team performance measurements were A) a primary ventricular fibrillation arrest, and B) an evolving MI with torsades de points polymorphic ventricular fibrillation arrest. The scenarios were custom programmed and delivered using the Laerdal SimMan high fidelity simulation system.

Evaluation/Scoring: Each team was scored and timed on 12 standardized elements:

The measured elements were further assigned a category of "assessment" or" therapy" and timed elements were assigned a within standard time interval to establish "correct performance". Non timed elements were assigned a completed or not completed status.

THERAPY MEASURES

1. Oxygen given within 1 min of scenario
2. IV access verbalized within 1 minute
3. Key Medication administered within 1 minute of clinical event trigger
4. Shock performed (Test A- within 1 min of ventricular fibrillation, Test B-within 1 min of scenario initiation)
5. CPR performed (Test A-within 30 sec of ventricular fibrillation, Test B-within 1 min of scenario)
6. Intubation performed within 3 min

ASSESSMENT MEASURES

1. Roles identified
2. Airway status verbalized
3. Breathing status verbalized
4. Pulse check within 30 sec
5. Disability status checked
6. ABC status rechecked after 3 min of the scenario

Scoring:

2=Team performed the action within the standard

1=Team performed the action not within the standard

0=Team did not perform the action

Analysis:

Statistical Analysis. Data from 42 teams (seven sets of six combinations of team members) was imported into Stata 11.0. Each team had information on 12 tasks in each of two different scenarios. For each of the tasks, the time to completion as well as score was recorded. A team's score had three possible categories: 1) "did not perform action", 2) "performed the action not within the standard", and 3) "performed the action within the standard". For the purposes of the primary analysis, the second and third categories were combined. Also, the time to completion of the overall scenario was recorded.

Descriptive statistics such as means, standard deviations, and frequencies were computed for each group (foreign / co-trained), at each timepoint (baseline/remote), and for each scenario (A/B) for both the time and score data. Because time data is naturally right-skewed, the natural log was taken to normalize the data.

Because each team participated in both scenarios in sequence, a crossover model was used to test for a significant carryover effect. A linear mixed model with scenario, scenario order, and their interaction were included as fixed effects, while set and teams (nested within set) were included as random effects. A significant interaction term would mean that the effect of scenario on completion time depends on the order of the sequence. None of the 12 tasks had this carryover effect, so scenario and scenario order were used in subsequent models as covariates.

For the three hypotheses, linear (completion time) and logistic (score) regression models with random effects for set and team were used to account for the nesting structure of the data. The fixed effects were time point, group, their interaction, scenario, and scenario order. The first hypothesis, whether the effect of timepoint on task differed between groups, was investigated by checking the significance of the timepoint-by-group interaction. If this was non-significant, then main effects for timepoint and group were tested to answer the remaining two hypotheses.

RESULTS:

Participants

A total of 70 unique individuals participated. All were assigned practitioners at BAACH or TAMC. Each of the 42 four member teams was comprised of a physician team leader, two nurses and a medic or respiratory therapist. All team members, excepting the 7 "foreign" physician team leaders located at the TAMC site had completed a three hour crisis team training with didactic and resuscitation scenario-based simulation exercises. All physicians were hospital based and ACLS certified.

Findings:

The data represented in the data section at the end of this appendix represents the final analysis of factors. Overall there are no clinically significant differences in the differences for timed or

scored parameters examined for discrete or aggregate performance elements from on-site physician led resuscitation teams and off-site remote physician lead team performance, either by a co-trained or non-co-trained physician team leader. There are several statistically significant differences, which do not represent clinically relevant differences. These findings are summarized below:

Therapy Measures: (all times reported in seconds)

Intubation Time:

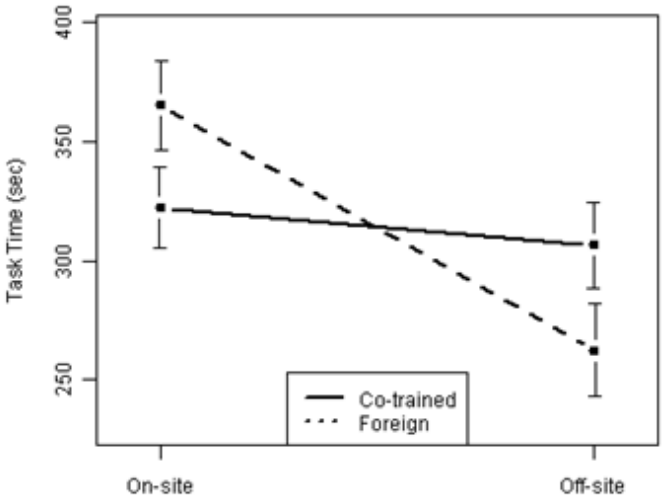
Intubation time decreased to a greater extent in the off-site foreign physician lead team when compared to the co-trained off-site.

Intubation

Times

	On-site	Off-site
Co-trained	322	307
Foreign	365	262
Interaction p-value:	0.015	
Model Sample Size:	120	

Predicted Means



Medication administration Time:

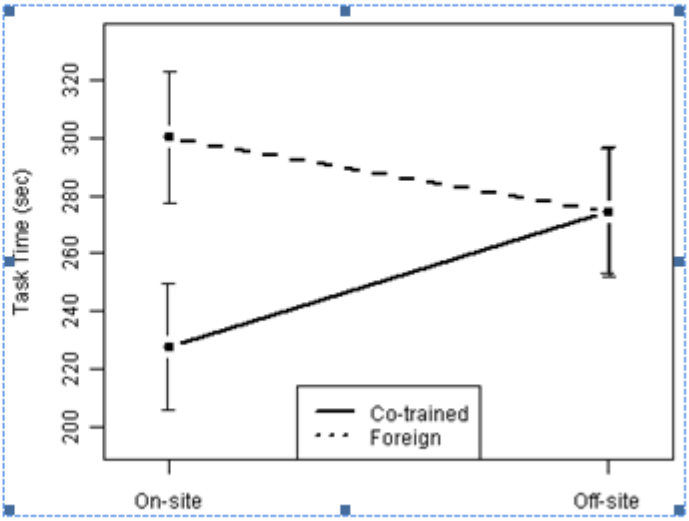
There were divergent changes in the time to administration of critical medications following baseline on-site performance. The co-trained physician lead teams increased the time to administration of critical medications, while the foreign physician lead teams decreased the time to administration of critical medications.

Meds

Times

	On-site	Off-site
Co-trained	228	275
Foreign	300	275
Interaction p-value:	0.023	
Model Sample Size:	155	

Predicted Means



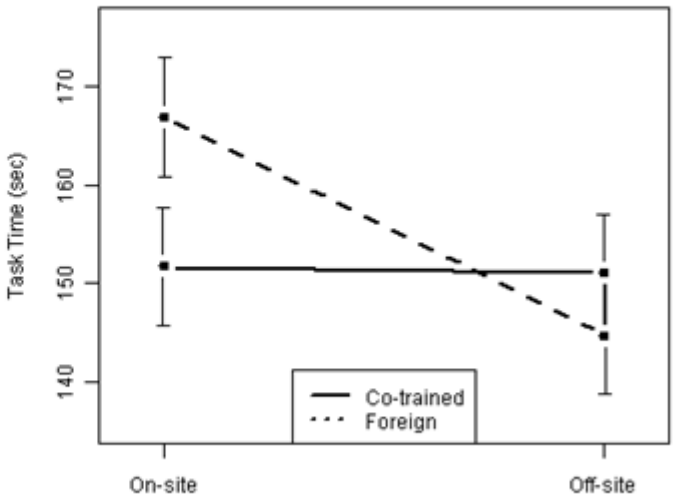
Composite Therapy Completion Time

The completion of critical therapeutic actions took less time in the cohort that was team lead by remote foreign physician than it did during baseline scenario completion with an on-site physician. This finding applied to all teams, including those that did not complete all six critical therapeutic tasks. Differences were not detected when analyzed separately for those teams that did complete all therapeutic tasks, or those that did not, although the trend was similar.

Therapy Composite Time

All observations

	On-site	Off-site
Co-trained	152	151
Foreign	167	145
Interaction p-value:	0.040	
Model Sample Size:	168	



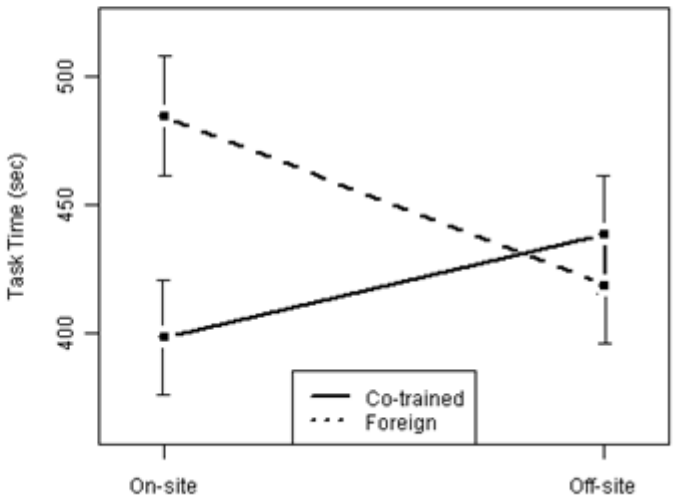
Total Scenario Time

Completion time of all 12 scenario measured elements or a maximum of ten minutes were utilized as measures of total scenario time. There were divergent changes in the time to scenario completion following baseline on-site performance. When comparing on-site to off-site, total scenario completion time the co-trained physician lead teams increased the time to completion, while the foreign physician lead teams decreased the time to completion.

Total Scenario Time

Predicted Means

	On-site	Off-site
Co-trained	398	438
Foreign	484	419
Interaction p-value:	0.014	
Model Sample Size:	168	



Assessment Measures:

The assessment measures were analyzed for dependency on the specific scenario, the order of scenario completion, the presence of foreign team leader, and the location of the team leader. The findings are summarized in Table 1 in the data section at the end of this appendix. Similar to the findings for therapy measures there were several statistically different assessment measures, but not of these timed differences was of a clinically relevant magnitude. These findings are summarized below.

Breathing

> The presence of a foreign team leader during remote resuscitation supervision was associated with a 15.17 second decrease in the time at which assessment of the patients breathing status was assessed.

Disability

> Off-site physician remote team leader was associated with a 7.67 second decrease in the time at which disability was assessed, compared to on site physician leader participation

Discussion and Conclusions:

The primary findings lead to a brief and simple set of conclusions. First, remote simulation techniques can be utilized to study telehealth. This report of our experience demonstrates convincingly that robust data collection is possible and can be used to compare performance of locally and remotely located participants in telehealth activities. This is a powerful approach which allows hypothesis testing, rapid prototyping of telehealth workflow, and comparison of on-site versus off site processes. Remote control of simulator sessions has now been demonstrated in published reports, and in our laboratory, we are hopeful that this innovation will further simplify and accelerate the use of remote simulation as a tool to study telehealth.

The results of this study include statistically significant changes in several team resuscitation performance measures when comparing on-site to off-site physician leadership, modeled after the remote critical care consultation paradigm in clinical use at our institution. The results support the use of this clinical care model, and suggest that similar outcomes can be obtained when remotely located team leaders support resuscitation via telepresence.

While the few differences detected were clinically irrelevant, for example the total scenario time increased by 40 seconds for a co-trained remotely located physician when shifting to a remote supervision location, some trends may warrant further study to better inform the practice of remote critical care. First there is the intriguing finding that all but one assessment factor (circulation assessment time was 10.8 seconds longer) improved more when an off-site foreign physician facilitator

was involved, compared to an offsite non-foreign physician team leader. This suggests that a team leadership dynamic may exists that permits a non-familiar physician leader to initiate actions and correct team performance sooner than a familiar physician team leader. This study was not able to examine this hypothesis. Distancing of personal relationships may allow faster clinical decisions and task delegation. This hypothesis is contrary to the widely accepted concept that intact co-trained teams perform better in a variety of settings, healthcare and otherwise.

There were no consistent trends from on-site to off-site performance based on the presence of a familiar or unfamiliar physician team leader. This supports the concept that remotely located consultants can effectively participate in rapidly changing clinical situations, without immediate familiarity and personal relationships with the healthcare team members. This appears contrary to common perceptions that the personal relationships are the glue that holds together effective telehealth programs. However a distinction between the success of a program and the success of a clinical event is necessary. In our clinical program of remote critical care consultation we experienced multiple satisfactory clinical outcomes, yet a number of program elements were less than satisfactory. The failure to establish and implement referral guidelines, the failure to consider referral without on-site clinical support staff, and the failure to engage a broader range of disciplines that was more reflective of the remote ICU populations are all likely due to human factors issues and leadership issues, which do determine the ultimate viability of even the most clinically successful telehealth solutions.

IMMPACT RESEARCH DATA

Assessment Items

Table 1

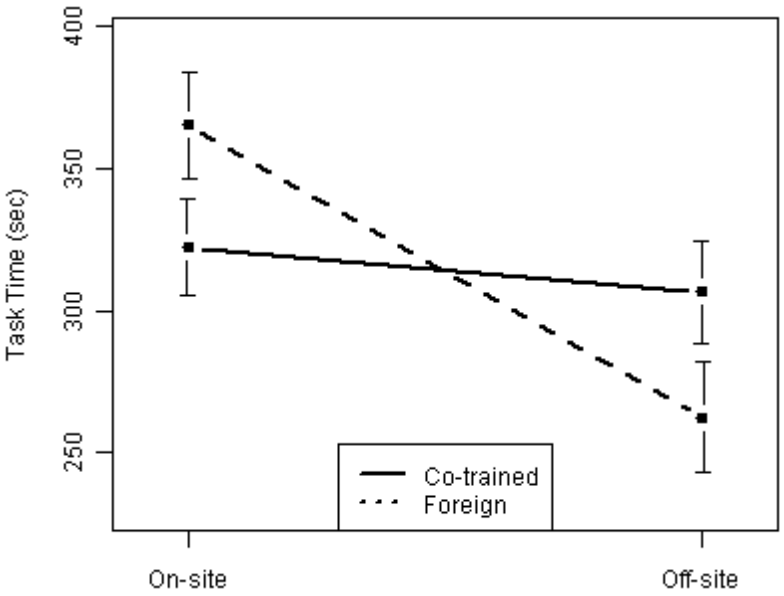
	Roles β (p-value)	**Airway**	**Breathing**	**Disability**	**Re-eval**	**Circulation**
			Time(Sec) (p)			
Scenario Order	1.084 (0.416)	2.238 (0.775)	9.910 (0.224)	-5.054 (0.235)	1.774 (0.550)	6.307 (0.432)
Off-site	-0.895 (0.501)	-5.429 (0.487)	-3.576 (0.661)	-7.670 (0.071)	-4.705 (0.113)	6.440 (0.422)
Foreign	-0.633 (0.663)	-17.98 (0.260)	-15.17 (0.063)	-2.647 (0.534)	-0.895 (0.784)	10.77 (0.182)
Observations	167	163	165	167	167	84

Intubation

Times

Predicted Means

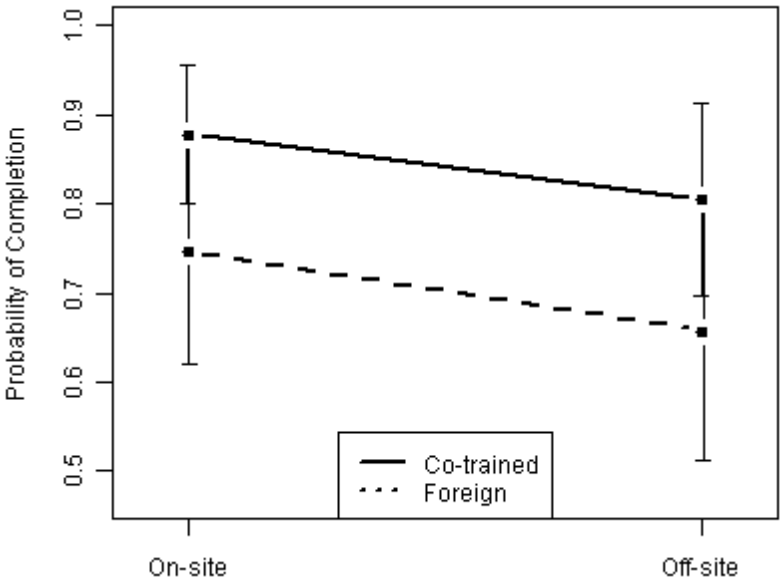
	On-site	Off-site
Co-trained	322	307
Foreign	365	262
Interaction p-value:	0.015	
Model Sample Size:	120	



Scores

Predicted Probabilities

	On-site	Off-site
Co-trained	0.88	0.80
Foreign	0.75	0.66
Interaction p-value:	0.882	
Model Sample Size:	168	

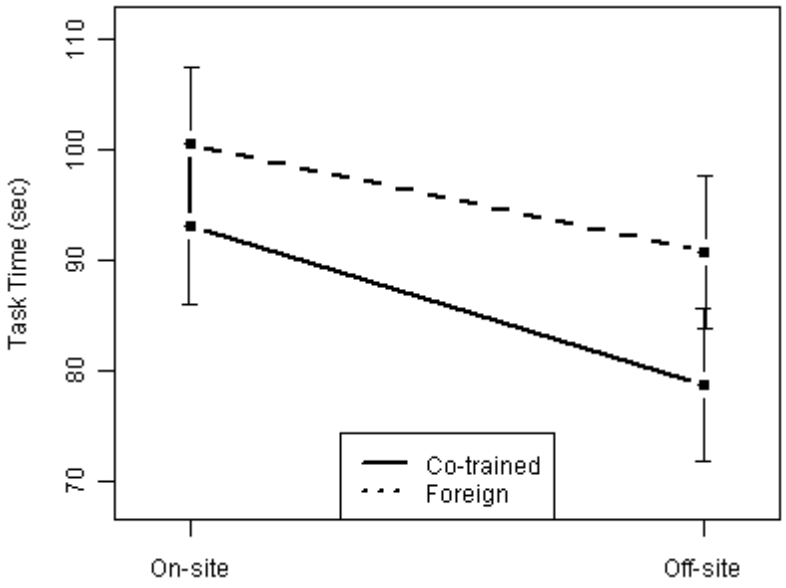


CPR

Times

Predicted Means

	On-site	Off-site
Co-trained	93	79
Foreign	101	91
Interaction p-value:	0.734	
Model Sample Size:	141	



Scores

Observed Probabilities

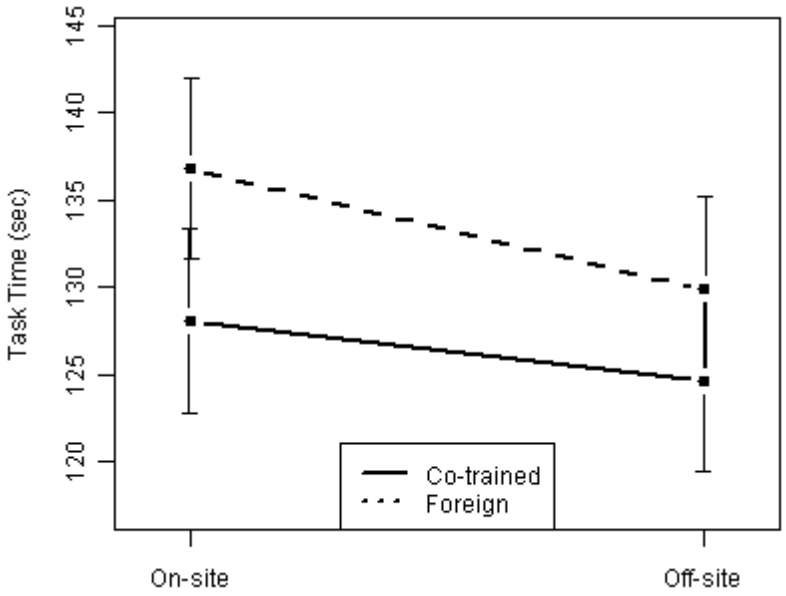
	On-site	Off-site
Co-trained	0.81	0.86
Foreign	0.83	0.86

Shock

Times

Predicted Means

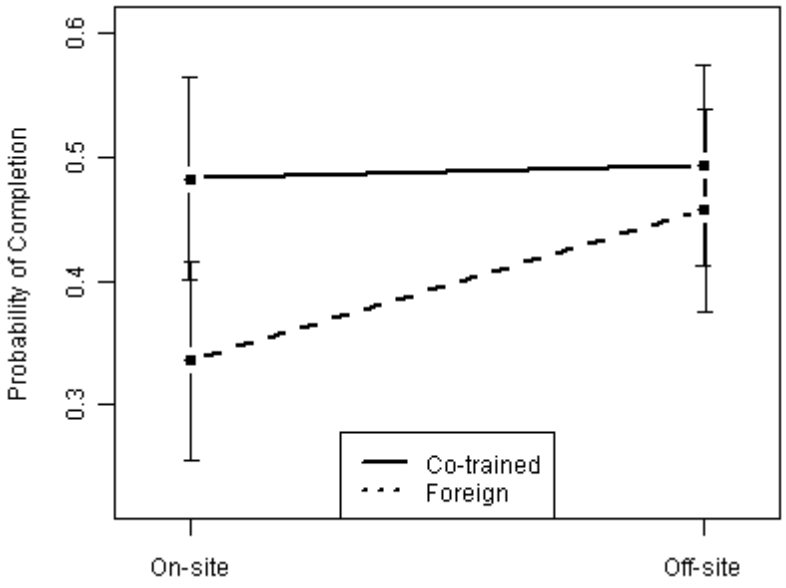
	On-site	Off-site
Co-trained	128	125
Foreign	137	130
Interaction p-value:	0.686	
Model Sample Size:	166	



Scores

Predicted Probabilities*

	On-site	Off-site
Co-trained	0.48	0.49
Foreign	0.34	0.46
Interaction p-value:	0.404	
Model Sample Size:	166	

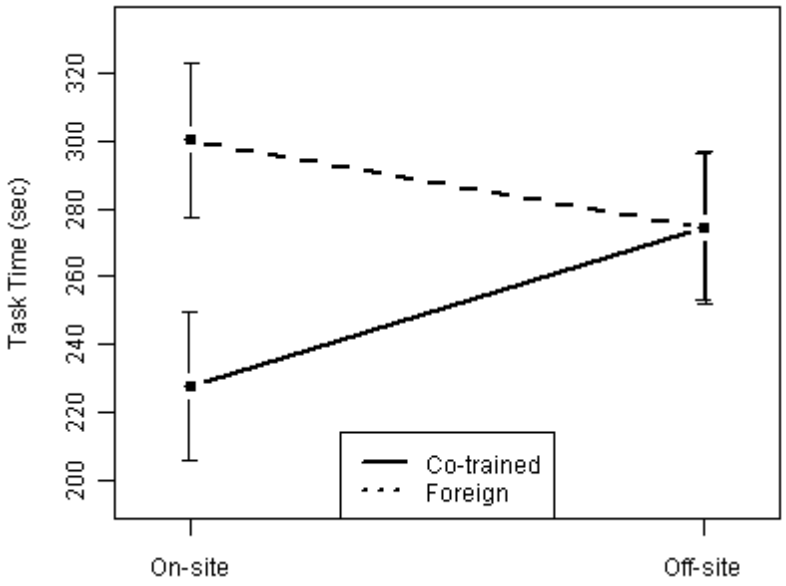


Meds

Times

Predicted Means

	On-site	Off-site
Co-trained	228	275
Foreign	300	275
Interaction p-value:	0.023	
Model Sample Size:	155	



Scores

Observed Probabilities

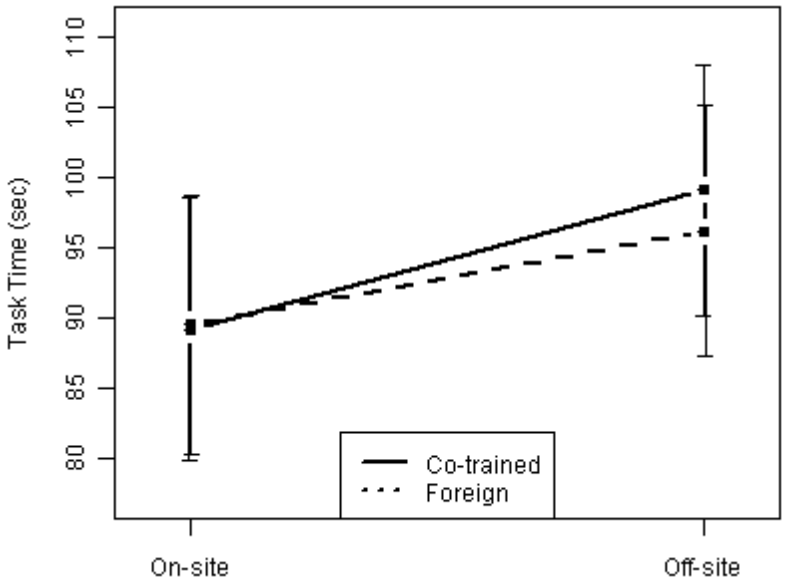
	On-site	Off-site
Co-trained	0.95	1.00
Foreign	0.83	0.90

IV

Times

Predicted Means

	On-site	Off-site
Co-trained	89	99
Foreign	89	96
Interaction p-value:	0.859	
Model Sample Size:	161	



Scores

Observed Probabilities

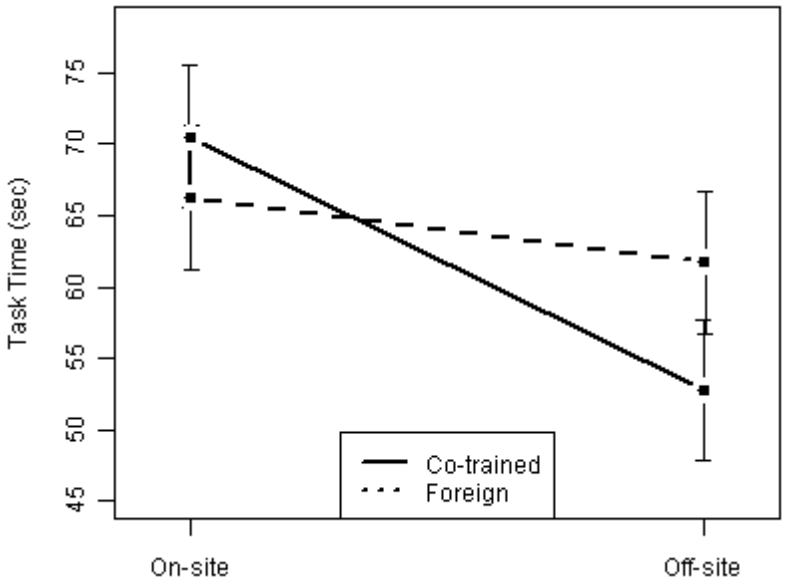
	On-site	Off-site
Co-trained	0.90	1.00
Foreign	0.93	1.00

O_2

Times

Predicted Means

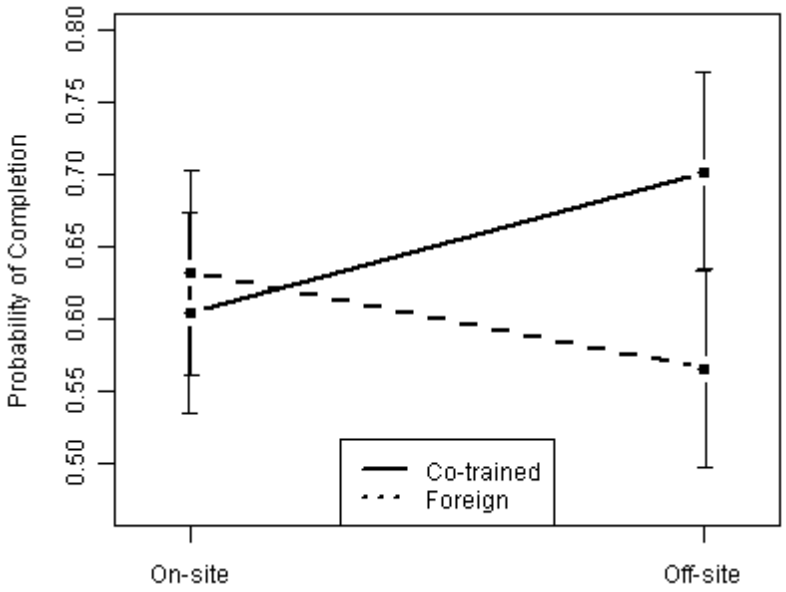
	On-site	Off-site
Co-trained	71	53
Foreign	66	62
Interaction p-value:	0.144	
Model Sample Size:	167	



Scores

Predicted Probabilities*

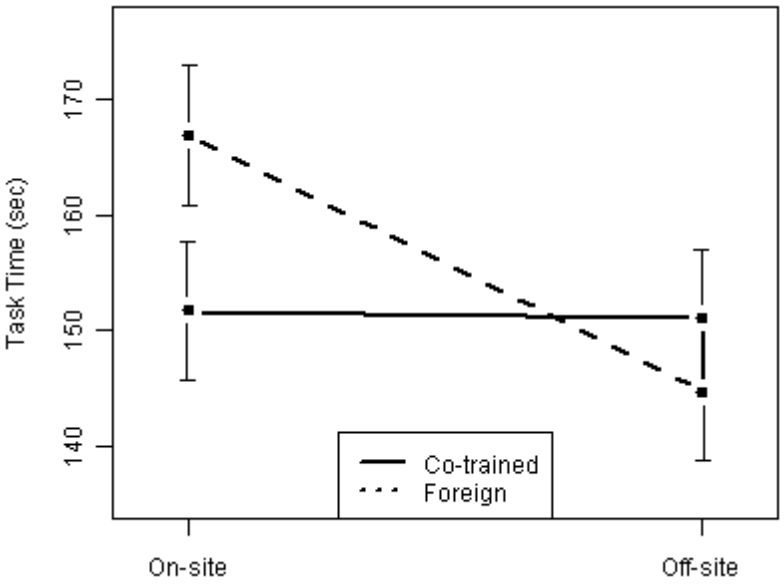
	On-site	Off-site
Co-trained	0.60	0.70
Foreign	0.63	0.57
Interaction p-value:	0.194	
Model Sample Size:	167	



Therapy Composite Time

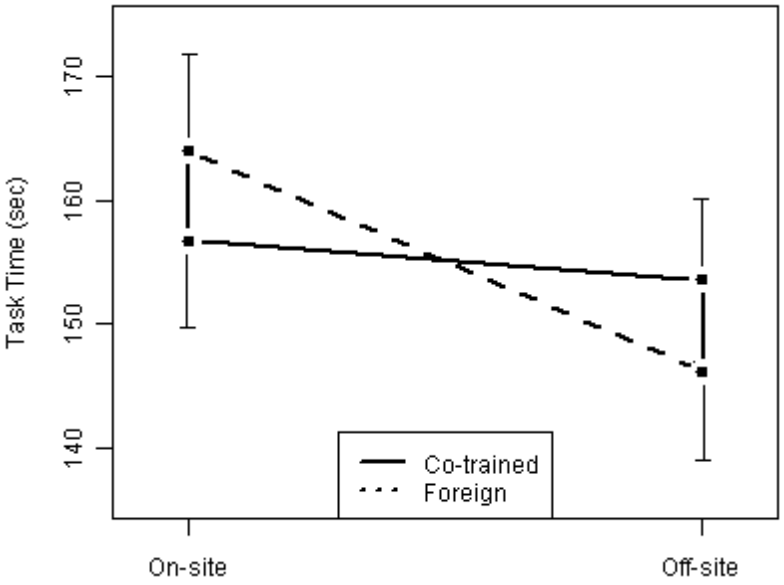
All observations

	On-site	Off-site
Co-trained	152	151
Foreign	167	145
Interaction p-value:	0.040	
Model Sample Size:	168	



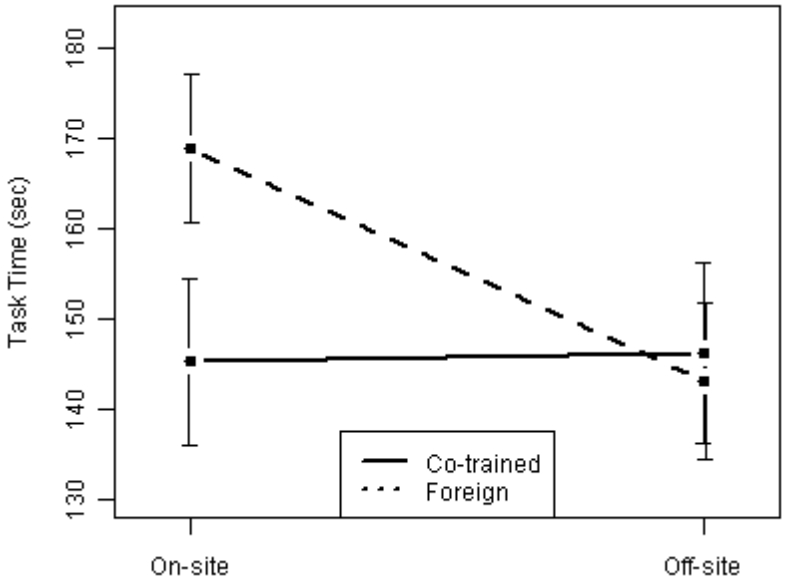
Complete Observations

	On-site	Off-site
Co-trained	157	153
Foreign	164	146
Interaction p-value:	0.277	
Model Sample Size:	84	



Incomplete Observations

	On-site	Off-site
Co-trained	145	146
Foreign	169	143
Interaction p-value:	0.124	
Model Sample Size:	84	

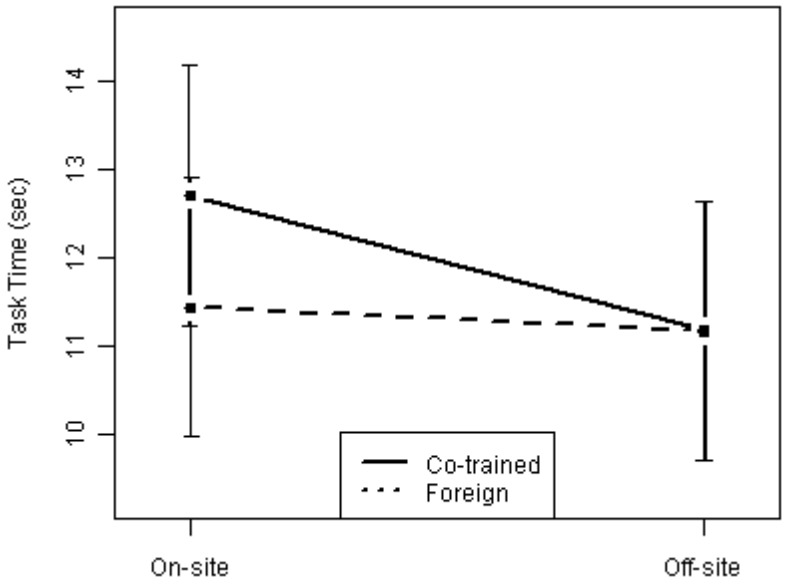


Roles

Times

Predicted Means

	On-site	Off-site
Co-trained	13	11
Foreign	11	11
Interaction p-value:	0.639	
Model Sample Size:	167	



Scores

Observed Probabilities

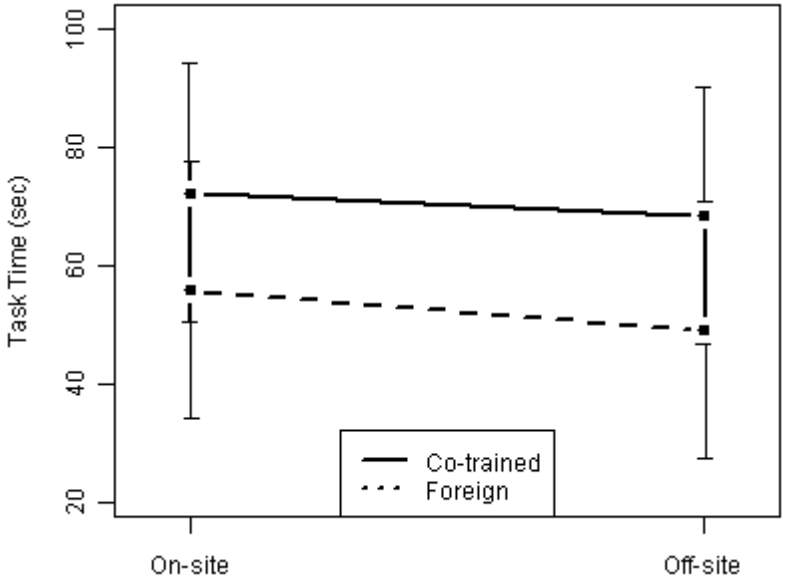
	On-site	Off-site
Co-trained	0.98	1.00
Foreign	1.00	1.00

Airway

Times

Predicted Means

	On-site	Off-site
Co-trained	72	68
Foreign	56	49
Interaction p-value:	0.847	
Model Sample Size:	163	



Scores

Observed Probabilities

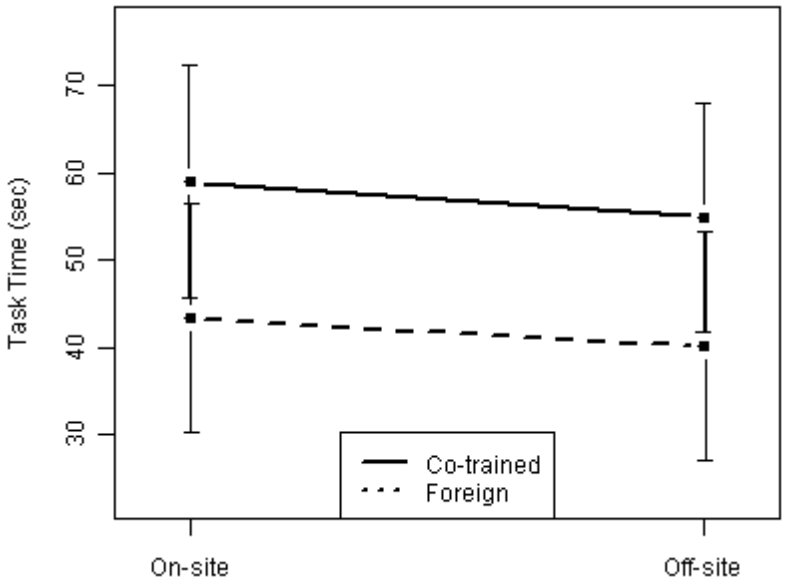
	On-site	Off-site
Co-trained	0.90 (38/42)	0.98 (41/42)
Foreign	1.00 (42/42)	1.00 (42/42)

Breathing

Times

Predicted Means

	On-site	Off-site
Co-trained	59	55
Foreign	43	40
Interaction p-value:	0.958	
Model Sample Size:	165	



Scores

Observed Probabilities

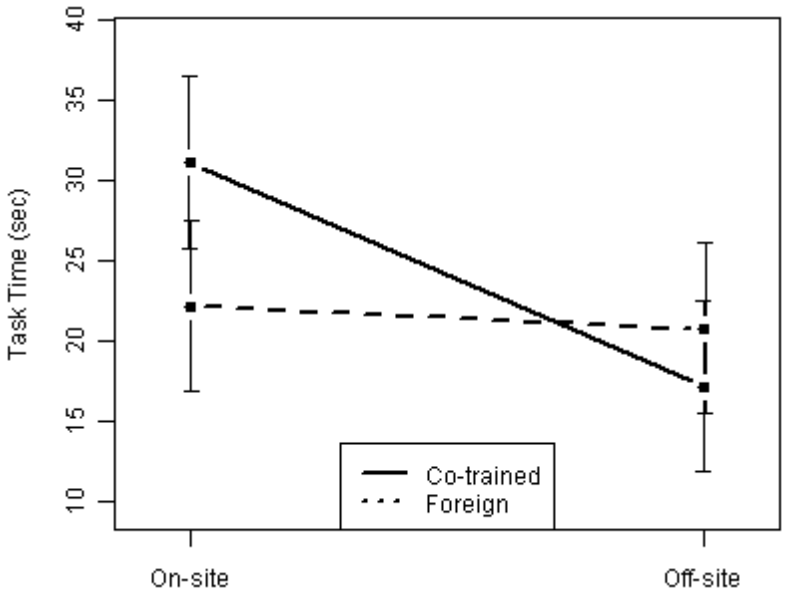
	On-site	Off-site
Co-trained	0.93 (39/42)	1.00 (42/42)
Foreign	1.00 (42/42)	1.00 (42/42)

Disability

Times

Predicted Means

	On-site	Off-site
Co-trained	31	17
Foreign	22	21
Interaction p-value:	0.136	
Model Sample Size:	167	



Scores

Observed Probabilities

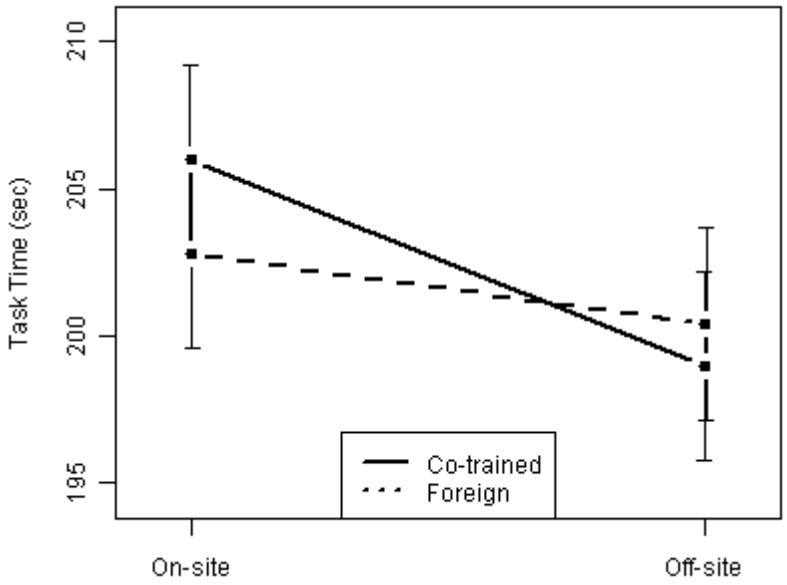
	On-site	Off-site
Co-trained	0.98 (41/42)	1.00 (42/42)
Foreign	1.00 (42/42)	1.00 (42/42)

Re-eval

Times

	On-site	Off-site
Co-trained	206	199
Foreign	203	200
Interaction p-value:	0.436	
Model Sample Size:	167	

Predicted Means

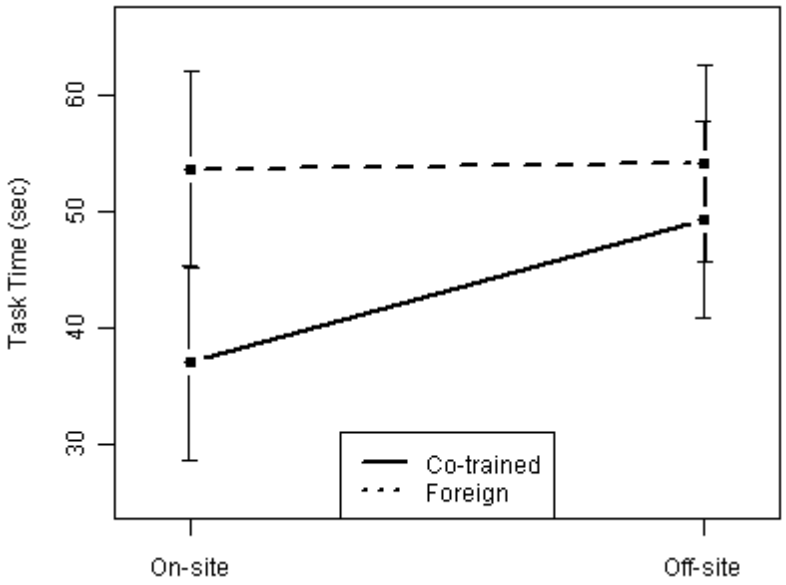


Circulation

Times

Predicted Means

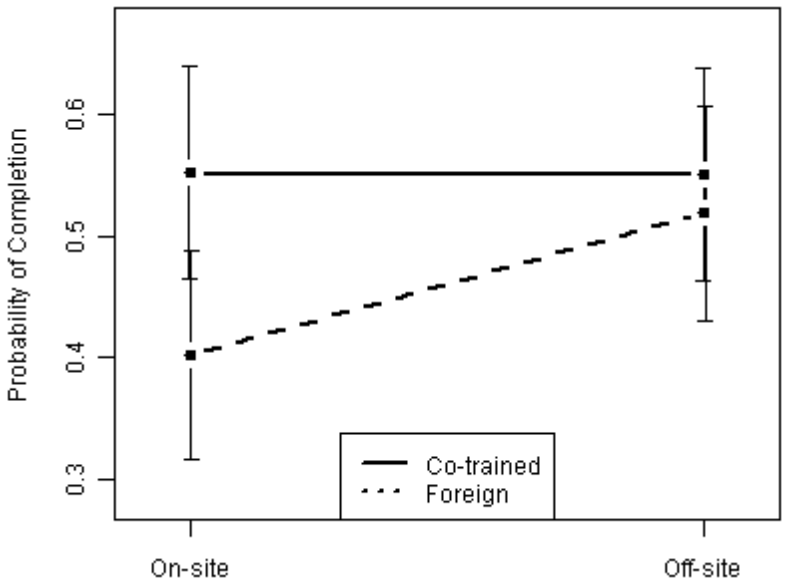
	On-site	Off-site
Co-trained	37	49
Foreign	54	54
Interaction p-value:	0.459	
Model Sample Size:	168	



Scores

Predicted Probabilities*

	On-site	Off-site
Co-trained	0.55	0.55
Foreign	0.40	0.52
Interaction p-value:	0.426	
Model Sample Size:	168	



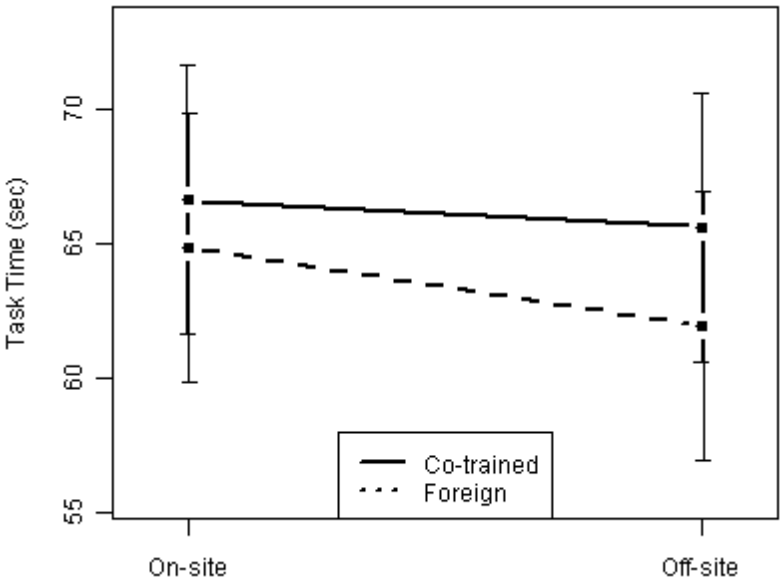
Assessment Composite Time

All Observations

	On-site	Off-site
Co-trained	67	66
Foreign	65	62

Interaction p-value: 0.745

Model Sample Size: 168

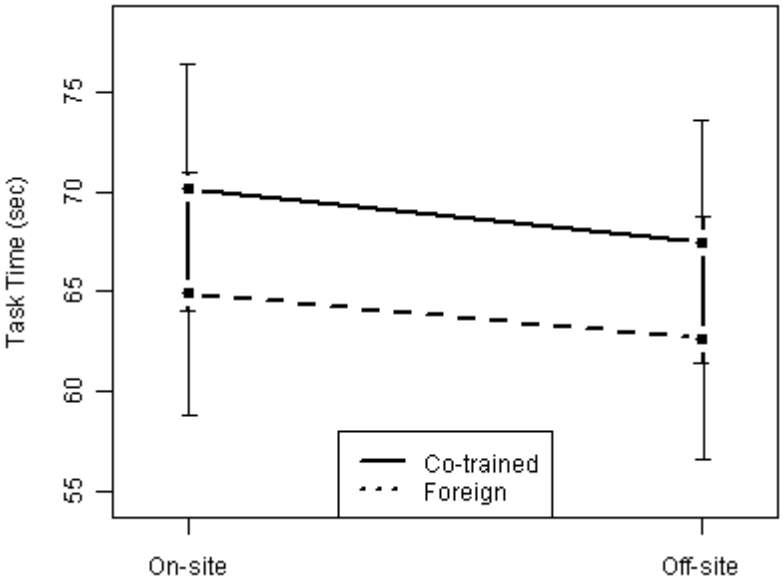


Complete Observations

	On-site	Off-site
Co-trained	70	67
Foreign	65	63

Interaction p-value: 0.931

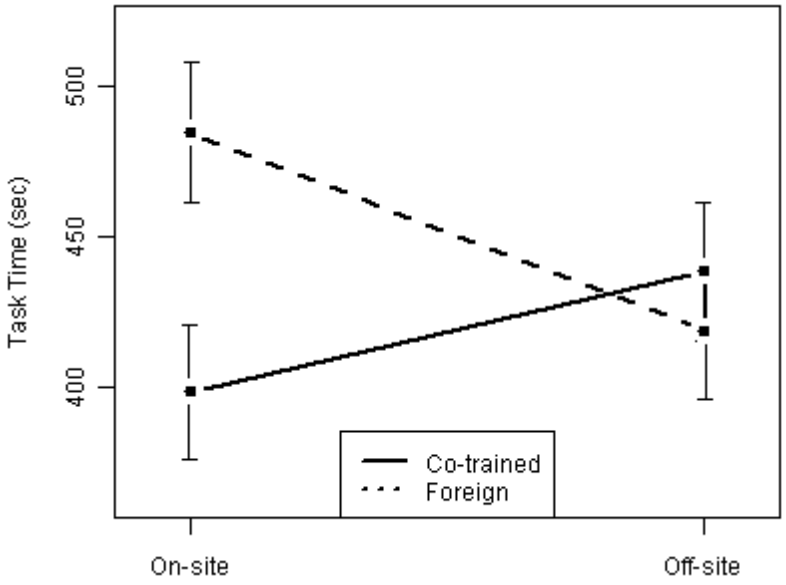
Model Sample Size: 160



Total Scenario Time

Predicted Means

	On-site	Off-site
Co-trained	398	438
Foreign	484	419
Interaction p-value:	0.014	
Model Sample Size:	168	



IMMPACT
FINAL REPORT 2010

APPENDIX
A-6

UNIVERSITY OF HAWAI'I AT MĀNOA

Telehealth Research Institute
John A. Burns School of Medicine

May 26, 2010

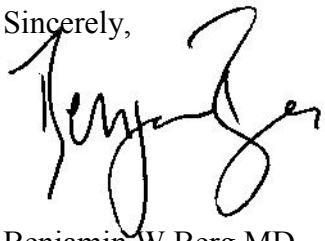
LT Macedonio M. Herrara
Head, Material Management Dept
Public Affairs Officer
U.S. Naval Hospital, Guam
PSC 490, Box 7717
FPO AP 96538-1600

Dear LT Herrera:

The University of Hawaii's ICU Multipoint Military Pacific Consultation using Telehealth (IMMPACT) project, funded by the US Army Medical Research and Materiel Command, is concluding and the attached list of equipment procured for the project by the University of Hawaii requires appropriate disposition.

As Principal Investigator of the IMMPACT project I donate this equipment, which is excess to University of Hawaii needs, to US Naval Hospital Guam for use in its operations. The gift is unconditional and the receiver will have no limitation on its ownership or use. The University of Hawaii is relieved of any liability or responsibility that may result from any action involving this equipment upon receipt of this letter and concurrence.

Sincerely,



Benjamin W Berg MD
Associate Professor of Medicine
Telehealth Research Institute
John A. Burns School of Medicine
University of Hawaii
651 Ilalo Streeet, MEB, Suite 212
Honolulu, HI 96813
Phone: 808-692-1093
Fax: 808-692-1250
Email: bwberg@hawaii.edu

Attachment: Equipment List

GUAM	ROUND-PARTY	PRICE	
ICU1	C-1	$0	
	C-2	$7,835	
	I-1	$7,287	
	I-2	$5,063	CHECK
	TOTAL	$20,185	

LOCATION CODE: ICU1				DESCRIPTION: GUAM ICU1 Nurses Work Area		REVISION - A					
FIND NO	QTY REQD	UNIT	MFGR	PART NO	NOMENCLATURE OR DESCRIPTION	UNIT COST	ISS COST	CUST COST	BUDGET COST	PARTY-ROUND	NOTES
5	2	EA	IBM	SYN-007	ThinkCentre S50 Small Form Factor Workstation	$1,621	$0	$3,242	$3,242	C-2	
6	2	EA	IBM	9419HB7	19.0" L191P ThinkVision Monitor	$450	$0	$900	$900	C-2	
7	2	EA	APC	BE500U	APC Back-UPS ES500	$70	$0	$140	$140	C-2	
11	1	EA	LOGITECH	961239-0403	Quickcam PRO 4000 Video	$100	$100	$0	$100	I-2	
12	1	PR	LABTECH	970082-0403	Spin 75 Speaker	$18	$18	$0	$18	I-2	
13	1	EA	PLANTRONICS	.AUDIO50	Monaural PC Headset	$12	$12	$0	$12	I-2	
16	1	EA	CABLES TO GO	20360	6ft VALUE SERIES 3.5mm STEREO PLUG to 3.5mm ST	$6	$6	$0	$6	I-2	
17	2	EA	SYMANTEC	10318995	PC Anywhere 11.5 Host/Remote	$196	$0	$392	$392	C-2	
18	2	EA	SYMANTEC	10280931	Norton Anti-Virus 2005 Complete Pkg (1 User	$50	$0	$100	$100	C-2	
						SUBTOTAL	$136	$4,774	$4,910		

LOCATION CODE: ICU1				DESCRIPTION: GUAM ICU1 Room Equipment		REVISION - A					
FIND NO	QTY REQD	UNIT	MFGR	PART NO	NOMENCLATURE OR DESCRIPTION	UNIT COST	ISS COST	CUST COST	BUDGET COST	PARTY-ROUND	NOTES
21	6	EA	CONTROL CABLE	KWRM6502	CC-232 AXIS -- 2ft	$15	$90	$0	$90	I-2	With AV RACK
22	6	EA	CONTROL CABLE	23209G002	CAT 5e Patch Cord, Gray, Gray Boots -- 2f	$6	$36	$0	$36	I-2	With AV RACK
23	6	EA	CONTROL CABLE	KWRM5568	A-1 Assy	$17	$102	$0	$102	I-2	With AV RACK
						SUBTOTAL	$228	$0	$228		

LOCATION CODE: ICU1				DESCRIPTION: GUAM ICU1 Audio Video Server Rack		REVISION - A					
FIND NO	QTY REQD	UNIT	MFGR	PART NO	NOMENCLATURE OR DESCRIPTION	UNIT COST	ISS COST	CUST COST	BUDGET COST	PARTY-ROUND	NOTES
2	2	EA	GREAT LAKES	7206-FRSL-AHD	Front & Rear Mount Sliding Shelves, Adjustable, 17.5"W	$169	$338	$0	$338	I-2	
3	1	EA	APC	SUA2200RM2U	APC Smart-UPS 2200 RM NET 120V 20AMP	$920	$0	$920	$920	C-2	
4	1	EA	DATACOM LINK CO	01G-048-RJ45	48 PORT CAT6 RJ45 FEED THRU PATCH PANEL	$450	$450	$0	$450	I-2	Assumes that network switch is wired directly to AV Servers, I.e., not through patch panel.
6	6	EA	CONTROL CABLE	KWRM5634G040	T1 SPECIAL ASSY RJ45/RJ45 -- 40ft	$16	$96	$0	$96	I-2	Cut cable in half to make W1015: PA6 to Patch Panel (Speaker) W1015B: Patch Panel (Microphone) to STM-3
7	12	EA	CONTROL CABLE	23370G020	CAT 5e Shielded Patch Cable, Gray, Gray Boots -- 20ft	$10	$120	$0	$120	I-2	W1012: AXIS Video Server Ethernet to Patch Panel W1013: Video Input, Patch Panel (camera) to Axis Server
8	6	EA	CONTROL CABLE	KWRM6651	CC-232-1	$15	$90	$0	$90	I-2	W1014: Camera Control, AXIS Server to Patch Panel (camera)
9	18	EA	CONTROL CABLE	23370G016	CAT 5e Shielded Patch Cable, Gray, Gray Boots -- 16ft	$9	$162	$0	$162	I-2	Cam Ctrl: Rack PP to Hosp PP Vid Input: Rack PP to Hosp PP Vid Srvr Enet: Rack PP to Hosp PP
10	6	EA	CONTROL CABLE	KWRM5634G016	T1 SPECIAL ASSY RJ45/RJ45 -- 16ft	$15	$90	$0	$90	I-2	Audio I/O Rack PP to Hosp PP
11	6	EA	AXIS	0176-004-01	2401+ Video Server	$682	$4,092	$0	$4,092	I-1	
12	6	EA	AXIS	0143-004-01	2191 Audio Module	$214	$1,284	$0	$1,284	I-1	
13	6	EA	RADIO DESIGN LAB	STM-3	High Gain Microphone Preamp	$115	$690	$0	$690	I-2	
14	6	EA	RADIO DESIGN LAB	ST-PA6	6 Watt Power Amplifier	$66	$396	$0	$396	I-2	
15	8	EA	RADIO DESIGN LAB	ST-PD5U	5 Way Switching Power Supply Distributor	$57	$456	$0	$456	I-2	
16	20	EA	RADIO DESIGN LAB	DTB	Detachable Terminal Block	$6	$120	$0	$120	I-2	
17	6	EA	ASTEC	AEE00C24	24VDC to 15VDC Power Converter	$45	$270	$0	$270	I-2	
18	2	EA	RADIO DESIGN LAB	PS-24U2A	Power Supply Only Used For ST-PD5U	$55	$110	$0	$110	I-2	
19	6	EA	MUXLAB	50000	VideoEase CCTV Modular Balun	$30	$180	$0	$180	I-2	
20	6	EA	ACTION ELECTRON	PP-BNC3306	M-F Right Angle Adapter	$3	$18	$0	$18	I-2	
21	3	EA	CONTROL CABLE	KWRM6860	VISICU PD5U/PD5U PWR 12"	$2	$6	$0	$6	I-2	W1004: 1st PD-5U to 2nd PD-5U
22	3	EA	CONTROL CABLE	KWRM6861	VISICU PD5U/PD5U PWR 9"	$2	$6	$0	$6	I-2	W1004: 1st PD-5U to 2nd PD-5U
23	6	EA	ACTION ELECTRON	PH-TC250	2.5mm x 5.5mm OD Dc Cord	$2	$12	$0	$12	I-2	W1009: 2nd PD-5U to AXIS Video Server
24	12	FT	CONTROL CABLE	KWRM6862	VISICU AMP-PWR	$2	$24	$0	$24	I-2	W1008: 2nd PD-5U to STM-3 & PA-6
25	6	EA	CONTROL CABLE	KWRM6826	VISICU AXIS-DC/DC PWR	$2	$12	$0	$12	I-2	W1011: 2nd PD-5U to DC/DC Converter
26	6	EA	CONTROL CABLE	KWRM6808G001*	VISICU AXIS-AUDIO PWR -- 9 inches outside-to-outside	$5	$30	$0	$30	I-2	W1010: DC/DC Conv. To AXIS Audio
27	6	EA	CONTROL CABLE	KWRM6863	VISICU AXIS AUDIO-STM3-C	$2	$12	$0	$12	I-2	W1007: STM-3 to AXIS Audio
28	6	EA	CONTROL CABLE	KWRM6864	VISICU AXIS AUDIO-PA6-C	$2	$12	$0	$12	I-2	W1007: AXIS Audio to PA6
29	6	FT	CONTROL CABLE	KWRM6655	AXIS-COM 5"	$13	$78	$0	$78	I-2	W1006: AXIS Audio to AXIS Video
30	150	EA	CONTROL CABLE	60723	Cat 5e Shielded RJ-45 Connector	$2	$300	$0	$300	I-2	
31	6	EA	SQUIRES ELECTRO	338849	L 4.000 x 0.188T x 0.188T UL1061 22/7 RED	$1	$6	$0	$6	I-2	STM-3 Phantom Jumper
32	6	EA	CONTROL CABLE	KWRM7682	REV A: AXIS SWITCH INPUT ASSY	$15	$90	$0	$90	I-2	
33	6	EA	ALLIED ELECTRON	283-1512	DC Power Plug	$2	$12	$0	$12	I-2	
						SUBTOTAL	$9,562	$920	$10,482		

LOCATION CODE: ICU1				DESCRIPTION: GUAM ICU1 Spares		REVISION - A					
FIND NO	QTY REQD	UNIT	MFGR	PART NO	NOMENCLATURE OR DESCRIPTION	UNIT COST	ISS COST	CUST COST	BUDGET COST	PARTY-ROUND	NOTES
5	1	EA	IBM	SYN-007	ThinkCentre S50 Small Form Factor Workstation	$1,621	$0	$1,621	$1,621	C-2	
6	1	EA	IBM	9419HB7	19.0" L191P ThinkVision Monitor	$450	$0	$450	$450	C-2	
7	1	EA	APC	BE500U	APC Back-UPS ES500	$70	$0	$70	$70	C-2	
9	1	EA	PLANTRONICS	.AUDIO50	Monaural PC Headset	$12	$12	$0	$12	I-2	
10	1	EA	SONY	EVI-D70W	Camera with Power Supply - WHITE	$850	$850	$0	$850	I-1	
11	1	EA	SHURE	MX202 B/C	Cardioid Microphone	$160	$160	$0	$160	I-1	
16	1	PR	LABTECH	970082-0403	Spin 75 Speaker	$18	$18	$0	$18	I-2	
17	1	EA	CONTROL CABLE	KWRM6502	CC-232 AXIS -- 2ft	$15	$15	$0	$15	I-2	
18	1	EA	CONTROL CABLE	23209G002	CAT 5e Patch Cord, Gray, Gray Boots -- 2ft	$6	$6	$0	$6	I-2	
19	1	EA	CONTROL CABLE	KWRM5568	A-1 Assy	$17	$17	$0	$17	I-2	
21	1	EA	AXIS	0176-004-01	2401+ Video Server	$682	$682	$0	$682	I-1	
22	1	EA	AXIS	0143-004-01	2191 Audio Module	$214	$214	$0	$214	I-1	
23	1	EA	RADIO DESIGN LAB	STM-3	High Gain Microphone Preamp	$115	$115	$0	$115	I-2	
24	1	EA	RADIO DESIGN LAB	ST-PA6	6 Watt Power Amplifier	$66	$66	$0	$66	I-2	
25	1	EA	RADIO DESIGN LAB	ST-PD5U	5 Way Switching Power Supply Distributor	$57	$57	$0	$57	I-2	
26	1	EA	RADIO DESIGN LAB	DTB	Detachable Terminal Block	$6	$6	$0	$6	I-2	
27	1	EA	ASTEC	AEE00C24	24VDC to 15VDC Power Converter	$45	$45	$0	$45	I-2	
28	1	EA	RADIO DESIGN LAB	PS-24U2A	Power Supply Only Used For ST-PD5U	$55	$55	$0	$55	I-2	
29	2	EA	MUXLAB	50000	VideoEase CCTV Modular Balun	$30	$60	$0	$60	I-2	
30	1	EA	ACTION ELECTRON	PP-BNC3306	M-F Right Angle Adapter	$3	$3	$0	$3	I-2	
31	1	EA	CONTROL CABLE	KWRM6860	VISICU PD5U/PD5U PWR 12"	$2	$2	$0	$2	I-2	W1004: 1st PD-5U to 2nd PD-5U
32	1	EA	CONTROL CABLE	KWRM6861	VISICU PD5U/PD5U PWR 9"	$2	$2	$0	$2	I-2	W1004: 1st PD-5U to 2nd PD-5U
33	1	EA	ACTION ELECTRON	PH-TC250	2.5mm x 5.5mm OD Dc Cord	$2	$2	$0	$2	I-2	W1009: 2nd PD-5U to AXIS Video Server
34	1	FT	CONTROL CABLE	KWRM6862	VISICU AMP-PWR	$2	$2	$0	$2	I-2	W1008: 2nd PD-5U to STM-3 & PA-6
35	1	EA	CONTROL CABLE	KWRM6826	VISICU AXIS-DC/DC PWR	$2	$2	$0	$2	I-2	W1011: 2nd PD-5U to DC/DC Converter
36	1	EA	CONTROL CABLE	KWRM6808G001*	VISICU AXIS-AUDIO PWR -- 9 inches outside-to-outside	$5	$5	$0	$5	I-2	W1010: DC/DC Conv. To AXIS Audio
37	1	EA	CONTROL CABLE	KWRM6863	VISICU AXIS AUDIO-STM3-C	$2	$2	$0	$2	I-2	W1007: STM-3 to AXIS Audio
38	1	EA	CONTROL CABLE	KWRM6864	VISICU AXIS AUDIO-PA6-C	$2	$2	$0	$2	I-2	W1007: AXIS Audio to PA6
39	1	FT	CONTROL CABLE	KWRM6655	AXIS-COM 5"	$13	$13	$0	$13	I-2	W1006: AXIS Audio to AXIS Video
40	1	EA	CABLES TO GO	20360	6ft VALUE SERIES 3.5mm STEREO PLUG to 3.5mm ST	$6	$6	$0	$6	I-2	
46	1	EA	EIKO	656	Lamp, Miniature, T-3 1/4, Wedge Base, 28.00 Volts, 0.06	$5	$5	$0	$5	I-1	
						SUBTOTAL	$2,424	$2,141	$4,565		

UNIVERSITY OF HAWAIʻI AT MĀNOA

Telehealth Research Institute
John A. Burns School of Medicine

April 16, 2010

John Y. Kim, MD
Major, U.S. Army Medical Corps
Staff, Internal Medicine
Brian Allgood Army Community Hospital/121 Combat Support Hospital
Box 009
APO AP 96205

Dear Dr. Kim:

The University of Hawaii's ICU Multipoint Military Pacific Consultation using Telehealth (IMMPACT) project, funded by the US Army Medical Research and Materiel Command, is concluding and the attached list of equipment procured for the project by the University of Hawaii requires appropriate disposition.

As Principal Investigator of the IMMPACT project I donate this equipment, which is excess to University of Hawaii needs, to Brian Allgood Army Community Hospital for use in its operations. The gift is unconditional and the receiver will have no limitation on its ownership or use. The University of Hawaii is relieved of any liability or responsibility that may result from any action involving this equipment upon receipt of this letter and concurrence.

Sincerely,

Benjamin W Berg MD
Associate Professor of Medicine
Telehealth Research Institute
John A. Burns School of Medicine
University of Hawaii
651 Ilalo Streeet, MEB, Suite 212
Honolulu, HI 96813
Phone: 808-692-1093
Fax: 808-692-1250
Email: bwberg@hawaii.edu

Attachment: Equipment list

KOREA	ROUND-PARTY	PRICE	
ICU2	C-1	$0	
	C-2	$7,839	
	I-1	$22,034	
	I-2	$15,149	CHECK
	TOTAL	$45,022	$45,022

LOCATION CODE: ICU2 **DESCRIPTION: KOREA ICU2 Nurses Work Area** **REVISION - A**

FIND NO	QTY REQD	UNIT	MFGR	PART NO	NOMENCLATURE OR DESCRIPTION	UNIT COST	ISS COST	CUST COST	BUDGET COST	PARTY-ROUND	NOTES
5	2	EA	IBM	SYN-007	ThinkCentre S50 Small Form Factor Workstation	$1,621	$0	$3,242	$3,242	C-2	
6	2	EA	IBM	9419HB7	19.0" L191P ThinkVision Monitor	$450	$0	$900	$900	C-2	
7	2	EA	APC	BE500U	APC Back-UPS ES500	$70	$0	$140	$140	C-2	
8	1	EA	HP	Q5956A#ABA	LaserJet 2420dn Printer	$899	$0	$899	$899	C-2	
9	1	EA	UMAX	UMX-SPKG-14127	Umax Powerlook 2100XL Scanner	$1,289	$1,289	$0	$1,289	I-2	Requires Mini-Tower Workstation
10	1	EA	APC	PRO7	Professional SurgeArrest 7 Outlet 120V	$25	$0	$25	$25	C-2	For Printer and Scanner
11	1	EA	LOGITECH	961239-0403	Quickcam PRO 4000 Video	$100	$100	$0	$100	I-2	
12	1	PR	LABTECH	970082-0403	Spin 75 Speaker	$18	$18	$0	$18	I-2	
13	1	EA	PLANTRONICS	.AUDIO50	Monaural PC Headset	$12	$12	$0	$12	I-2	
16	1	EA	CABLES TO GO	20360	6ft VALUE SERIES 3.5mm STEREO PLUG to 3.5mm STE	$6	$6	$0	$6	I-2	
17	2	EA	SYMANTEC	10318995	PC Anywhere 11.5 Host/Remote	$196	$0	$392	$392	C-2	
18	2	EA	SYMANTEC	10280931	Norton Anti-Virus 2005 Complete Pkg (1 User)	$50	$0	$100	$100	C-2	
19	1	EA	CISCO	Gear	Communications Equipment	$12,000	$12,000	$0	$12,000	I-2	
						SUBTOTAL	$13,425	$5,698	$19,123		

LOCATION CODE: ICU2 **DESCRIPTION: KOREA ICU2 Room Equipment** **REVISION - A**

FIND NO	QTY REQD	UNIT	MFGR	PART NO	NOMENCLATURE OR DESCRIPTION	UNIT COST	ISS COST	CUST COST	BUDGET COST	PARTY-ROUND	NOTES
1	6	EA	SONY	EVI-D70W	Camera with Power Supply - WHITE	$850	$5,100	$0	$5,100	I-1	
2	6	EA	MUXLAB	50000	VideoEase CCTV Modular Balun	$30	$180	$0	$180	I-2	
3	6	EA	ALLIED ELECTRONI	202-0840	Adapter, RCA Male to BNC Female	$3	$18	$0	$18	I-2	
4	6	EA	ACTION ELECTRON	PP-BNC3306	M-F Right Angle Adapter	$3	$18	$0	$18	I-2	
5	6	EA	ISS	V0002A	In Room A/V Server	$2,060	$12,360	$0	$12,360	I-1	
6	6	EA	SHURE	MX202 B/C	Cardioid Microphone	$160	$960	$0	$960	I-1	
7	6	EA	JBL	CONTROL 24C - MICRO	2-Way Ceiling Speaker -- White	$65	$390	$0	$390	I-2	
9	6	EA	SAFETY TECHNOLG	SS-2317EICU	WH Pushbutton, BS Cover, Mom Illum, eICU Label	$62	$372	$0	$372	I-1	
13	6	EA	GCX	WC-0002-01	Std (7") Wall Channel w/Hardware	$25	$150	$0	$150	I-2	
14	6	EA	PELCO	EM4400	Wall Mount w/Feed Thru	$65	$390	$0	$390	I-2	
16	6	EA	JLS FASTENERS	78121	1/4-20 x 1/2" Flat Head Slotted Machine Screw Zinc	$1	$6	$0	$6	I-2	
17	6	EA	CONTROL CABLE	KWRM6502G003*	CC-232 AXIS -- 2.5 ft	$13	$78	$0	$78	I-2	RS-232 Camera Control Cable
18	42	EA	CONTROL CABLE	23209G003*	CAT 5e Patch Cord, Gray, Gray Boots -- 2.5 ft	$5	$210	$0	$210	I-2	1. Video Cable (RJ-45 to RJ-45)
19	6	EA	CONTROL CABLE	KWRM6816G003*	AUD-2 -- 2.5 FT	$15	$90	$0	$90	I-2	Microphone Cable (XIR3 to RJ-45)
20	6	EA	CONTROL CABLE	KWRM7721	REV -: VISICU CALL BUTTON ASSY	$15	$90	$0	$90	I-1	eLert Pigtail
						SUBTOTAL	$20,412	$0	$20,412		

LOCATION CODE: ICU2 **DESCRIPTION: KOREA ICU2 Spares** **REVISION - A**

FIND NO	QTY REQD	UNIT	MFGR	PART NO	NOMENCLATURE OR DESCRIPTION	UNIT COST	ISS COST	CUST COST	BUDGET COST	PARTY-ROUND	NOTES
5	1	EA	IBM	SYN-007	ThinkCentre S50 Small Form Factor Workstation	$1,621	$0	$1,621	$1,621	C-2	
6	1	EA	IBM	9419HB7	19.0" L191P ThinkVision Monitor	$450	$0	$450	$450	C-2	
7	1	EA	APC	BE500U	APC Back-UPS ES500	$70	$0	$70	$70	C-2	
8	1	EA	ISS	V0002A	In Room A/V Server	$2,060	$2,060	$0	$2,060	I-1	
9	1	EA	PLANTRONICS	.AUDIO50	Monaural PC Headset	$12	$12	$0	$12	I-2	
10	1	EA	SONY	EVI-D70W	Camera with Power Supply - WHITE	$850	$850	$0	$850	I-1	
11	1	EA	SHURE	MX202 B/C	Cardioid Microphone	$160	$160	$0	$160	I-1	
12	1	EA	JBL	CONTROL 24C - MICRO	2-Way Ceiling Speaker -- White	$65	$65	$0	$65	I-2	
13	1	EA	CONTROL CABLE	KWRM6502G003*	CC-232 AXIS -- 2.5 ft	$13	$13	$0	$13	I-2	RS-232 Camera Control Cable (8pin DIN to RJ45)
14	1	EA	CONTROL CABLE	23209G003*	CAT 5e Patch Cord, Gray, Gray Boots -- 2.5 ft	$5	$5	$0	$5	I-2	Video Cable (RJ-45 to RJ-45)
15	1	EA	CONTROL CABLE	KWRM6816G003*	AUD-2 -- 2.5 FT	$15	$15	$0	$15	I-2	Microphone Cable (XIR3 to RJ-45)
16	1	PR	LABTECH	970082-0403	Spin 75 Speaker	$18	$18	$0	$18	I-2	
29	2	EA	MUXLAB	50000	VideoEase CCTV Modular Balun	$30	$60	$0	$60	I-2	
40	1	EA	CABLES TO GO	20360	6ft VALUE SERIES 3.5mm STEREO PLUG to 3.5mm STE	$6	$6	$0	$6	I-2	
44	1	EA	CONTROL CABLE	KWRM7721	REV -: VISICU CALL BUTTON ASSY	$15	$15	$0	$15	I-1	
45	1	EA	SAFETY TECHNOLG	SS-2317EICU	WH Pushbutton, BS Cover, Mom Illum, eICU Label	$62	$62	$0	$62	I-1	
46	1	EA	EIKO	656	Lamp, Miniature, T-3 1/4, Wedge Base, 28.00 Volts, 0.06 A	$5	$5	$0	$5	I-1	
						SUBTOTAL	$3,346	$2,141	$5,487		

UNIVERSITY OF HAWAI'I AT MĀNOA

Telehealth Research Institute
John A. Burns School of Medicine

April 26, 2010

Eric Crawley, MD LTC MC USA
Chief of Critical Care
Tripler Army Medical Center
1 Jarrett White Road
Honolulu, HI 96859

Dear LTC Crawley:

The University of Hawaii's ICU Multipoint Military Pacific Consultation using Telehealth (IMMPACT) project, funded by the US Army Medical Research and Materiel Command, is concluding and the attached list of equipment procured for the project by the University of Hawaii requires appropriate disposition.

As Principal Investigator of the IMMPACT project I donate this equipment, which is excess to University of Hawaii needs, to Tripler Army Medical Center for use in its operations. The gift is unconditional and the receiver will have no limitation on its ownership or use. The University of Hawaii is relieved of any liability or responsibility that may result from any action involving this equipment upon receipt of this letter and concurrence.

Sincerely,

Benjamin W Berg MD
Associate Professor of Medicine
Telehealth Research Institute
John A. Burns School of Medicine
University of Hawaii
651 Ilalo Streeet, MEB¸ Suite 212
Honolulu, HI 96813
Phone: 808-692-1093
Fax: 808-692-1250
Email: bwberg@hawaii.edu

Attachment: Equipment list

Data Center	ROUND-PARTY	PRICE	
Servers	C-1	$207,165	
	C-2	$0	
	I-1	$15,000	
	I-2	$0	CHECK
	TOTAL	$222,165	$222,165

LOCATION CODE:	TAMC	DESCRIPTION:	TAMC Data Center Production Servers	REVISION - A					
FIND NO	QTY REQD	UNIT	MFGR	PART NO	NOMENCLATURE OR DESCRIPTION	UNIT COST	ISS COST	CUST COST	BUDGET COST	PARTY-ROUND	NOTES
u	4	EA	IBM	SYN-001	XSERIES 346 Server (All Servers)	$7,402	$0	$29,608	$29,608	C-1	
17	1	EA	IBM	SYN-002	NETBAY 42 Rack with Flat Panel Monitor & PDU's	$7,274	$0	$7,274	$7,274	C-1	
18	1	EA	IBM	SYN-003	NETBAY 2x8 Console Switch	$2,763	$0	$2,763	$2,763	C-1	
19	1	EA	IBM	0	IBM SAN	$55,000	$0	$55,000	$55,000	C-1	
19	5	EA	IBM	SYN-004	IBM NetBAY 12-foot Console Cable Set (one per server)	$65	$0	$325	$325	C-1	
23	2	EA	MICROSOFT	228-00971	Microsoft SQL Server 2000 Standard 1 Processor Licens	$4,691	$0	$9,382	$9,382	C-1	
24	1	EA	BUSINESS OBJECTS	F-FCD-E-WX-00	Crystal Reports Server v11 with Software Updates (5 Lic	$7,500	$7,500	$0	$7,500	I-1	Apply 5 packs evenly
25	2	EA	SOFTWARE FX	C15755P	CHART FX INET EDITION V5.5	$1,350	$0	$2,700	$2,700	C-1	
34	4	EA	SYMANTEC	10280931	Norton Anti-Virus 2005 Complete Pkg (1 User)	$50	$0	$200	$200	C-1	
						SUBTOTAL	$7,500	$107,252	$114,752		

LOCATION CODE:	TAMC	DESCRIPTION:	TAMC Data Center Staging Servers	REVISION - A					
FIND NO	QTY REQD	UNIT	MFGR	PART NO	NOMENCLATURE OR DESCRIPTION	UNIT COST	ISS COST	CUST COST	BUDGET COST	PARTY-ROUND	NOTES
5	4	EA	IBM	SYN-001	XSERIES 346 Server (All Servers)	$7,402	$0	$29,608	$29,608	C-1	
16	1	EA	IBM	SYN-003	NETBAY 2x8 Console Switch	$2,763	$0	$2,763	$2,763	C-1	
19	1	EA	IBM	0	IBM SAN	$55,000	$0	$55,000	$55,000	C-1	
17	4	EA	IBM	SYN-004	IBM NetBAY 12-foot Console Cable Set (one per server)	$65	$0	$260	$260	C-1	
7	2	EA	MICROSOFT	228-00971	Microsoft SQL Server 2000 Standard 1 Processor Licens	$4,691	$0	$9,382	$9,382	C-1	
8	1	EA	BUSINESS OBJECTS	F-FCD-E-WX-00	Crystal Reports Server v11 with Software Updates (5 Lic	$7,500	$7,500	$0	$7,500	I-1	
9	2	EA	SOFTWARE FX	C15755P	CHART FX INET EDITION V5.5	$1,350	$0	$2,700	$2,700	C-1	
11	4	EA	SYMANTEC	10280931	Norton Anti-Virus 2005 Complete Pkg (1 User)	$50	$0	$200	$200	C-1	
						SUBTOTAL	$7,500	$99,913	$107,413		

Staging Equipment	ROUND-PARTY	PRICE	
	C-1	$1,891	
	C-2	$3,484	
	I-1	$3,070	
	I-2	$313	CHECK
	TOTAL	$8,758	$8,758

LOCATION CODE: TAMC				DESCRIPTION: TAMC Data Center Staging Workstations		REVISION - A				
FIND NO	QTY REQD	UNIT	MFGR	PART NO	NOMENCLATURE OR DESCRIPTION	UNIT COST	ISS COST	CUST COST	BUDGET COST	PARTY-ROUND	NOTES
5	1	EA	IBM	SYN-006	ThinkCentre M50 Mini-Tower Workstation	$1,662	$0	$1,662	$1,662	C-2	
6	3	EA	IBM	9419HB7	19.0" L191P ThinkVision Monitor	$450	$0	$1,350	$1,350	C-2	
7	1	EA	CREATIVE LABS	70SB040000005	Sound Blaster Audigy 2 Value - sound card	$75	$0	$75	$75	C-2	
8	1	EA	PNY TECHNOLOGIE	VCQ4400NVS-PB	Quadro4 NVS400 PCI 64MB	$397	$0	$397	$397	C-2	
9	1	EA	APC	SUA1500	APC Smart-UPS 1500	$500	$0	$500	$500	C-1	
10	1	EA	LOGITECH	961239-0403	Quickcam PRO 4000 Video	$100	$100	$0	$100	I-2	
11	1	PR	LABTECH	970082-0403	Spin 75 Speaker	$18	$18	$0	$18	I-2	
12	1	EA	PLANTRONICS	.AUDIO50	Monaural PC Headset	$12	$12	$0	$12	I-2	
13	1	EA	SONY	EVI-D70W	Camera with Power Supply - WHITE	$850	$850	$0	$850	I-1	
14	1	EA	ISS	V0002A	In Room A/V Server	$2,060	$2,060	$0	$2,060	I-1	
15	1	EA	SHURE	MX202 B/C	Cardioid Microphone	$160	$160	$0	$160	I-1	
16	1	EA	JBL	CONTROL 23 - WH	Wall Mount Speaker -- White	$85	$85	$0	$85	I-2	
17	1	EA	MUXLAB	50000	VideoEase CCTV Modular Balun	$30	$30	$0	$30	I-2	
18	1	EA	CONTROL CABLE	KWRM6502G003*	CC-232 AXIS -- 2.5 ft	$13	$13	$0	$13	I-2	RS-232 Camera Control Cable (8pin DIN to RJ45)
19	3	EA	CONTROL CABLE	23209G003*	CAT 5e Patch Cord, Gray, Gray Boots -- 2.5 ft	$5	$15	$0	$15	I-2	1. Video Cable (RJ-45 to RJ-45) 2. In-Room AV Server Call Button Cable (RJ-45 to RJ-45) 3. Wall Speaker Cable
20	2	EA	CONTROL CABLE	23370G006	CAT 5e Shielded Patch Cable, Gray, Gray Boots -- 6ft	$6	$12	$0	$12	I-2	Network Cable (RJ-45 to RJ-45)
21	1	EA	CONTROL CABLE	KWRM6816G003*	AUD-2 -- 2.5 FT	$15	$15	$0	$15	I-2	Microphone Cable (XIR3 to RJ-45)
22	1	EA	ALLIED ELECTRONI	202-0840	Adapter, RCA Male to BNC Female	$3	$3	$0	$3	I-2	
25	2	EA	SYMANTEC	10318995	PC Anywhere 11.5 Host/Remote	$196	$0	$392	$392	C-1	
27	1	EA	CABLES TO GO	20360	6ft VALUE SERIES 3.5mm STEREO PLUG to 3.5mm ST	$6	$6	$0	$6	I-2	
28	2	EA	SYMANTEC	10280931	Norton Anti-Virus 2005 Complete Pkg (1 User)	$50	$0	$100	$100	C-1	
29	1	EA	HP	Q5956A#ABA	LaserJet 2420dn Printer	$899	$0	$899	$899	C-1	
31	1	EA	JLS FASTENERS	78121	1/4-20 x 1/2" Flat Head Slotted Machine Screw Zinc	$1	$1	$0	$1	I-2	
32	1	EA	ACTION ELECTRON	PP-BNC3306	M-F Right Angle Adapter	$3	$3	$0	$3	I-2	
						SUBTOTAL	$3,383	$5,375	$8,758		

eICU	ROUND-PARTY	PRICE	
	C-1	$370	
	C-2	$8,114	
	I-1	$0	
	I-2	$290	CHECK
	TOTAL	$8,774	$8,774

LOCATION CODE: 0 **DESCRIPTION: TAMC** **REVISION -- A**

eICU Clinical Work Area

FIND NO	QTY REQD	UNIT	MFGR	PART NO	NOMENCLATURE OR DESCRIPTION	UNIT COST	ISS COST	CUST COST	BUDGET COST	PARTY-ROUND	NOTES
7	1	EA	IBM	SYN-006	ThinkCentre M50 Mini-Tower Workstation	$1,662	$0	$1,662	$1,662	C-2	
9	5	EA	IBM	9419HB7	19.0" L191P ThinkVision Monitor	$450	$0	$2,250	$2,250	C-2	
10	1	EA	CREATIVE LABS	70SB040000005	Sound Blaster Audigy 2 Value - sound card	$75	$0	$75	$75	C-2	
11	1	EA	PNY TECHNOLOGI	VCQ4400NVS-PB	Quadro4 NVS400 PCI 64MB	$397	$0	$397	$397	C-2	
12	2	EA	ERGOTRON	60-349-200	Desk Clamp	$75	$0	$150	$150	C-2	
13	2	EA	ERGOTRON	20-137-200	Monitor Pole	$35	$0	$70	$70	C-2	
14	4	EA	ERGOTRON	47-046-085	Monitor Pivot	$50	$0	$200	$200	C-2	
15	2	EA	ERGOTRON	60-443-200	Pole Clamp	$50	$0	$100	$100	C-2	
16	2	EA	ERGOTRON	60-410-200	Monitor Tri-Arm with Pivot	$190	$0	$380	$380	C-2	
21	1	EA	LOGITECH	961239-0403	Quickcam PRO 4000 Video	$100	$100	$0	$100	I-2	
23	1	EA	PLANTRONICS	.AUDIO50	Monaural PC Headset	$12	$12	$0	$12	I-2	
24	1	EA	MICROSOFT	021-06280	MS Office 2003 Standard	$370	$0	$370	$370	C-1	
25	1	EA	SYMANTEC	10318995	PC Anywhere 11.5 Host/Remote	$196	$0	$196	$196	C-2	
28	1	EA	CABLES TO GO	20360	6ft VALUE SERIES 3.5mm STEREO PLUG to 3.5mm STEREO JACK	$6	$6	$0	$6	I-2	
29	1	EA	SYMANTEC	10280931	Norton Anti-Virus 2005 Complete Pkg (1 User)	$50	$0	$50	$50	C-2	
						SUBTOTAL	$118	$5,900	$6,018		

LOCATION CODE: 0 **DESCRIPTION: TAMC** **REVISION -- A**

eICU Spares

FIND NO	QTY REQD	UNIT	MFGR	PART NO	NOMENCLATURE OR DESCRIPTION	UNIT COST	ISS COST	CUST COST	BUDGET COST	PARTY-ROUND	NOTES
7	1	EA	IBM	SYN-006	ThinkCentre M50 Mini-Tower Workstation	$1,662	$0	$1,662	$1,662	C-2	
9	1	EA	IBM	9419HB7	19.0" L191P ThinkVision Monitor	$450	$0	$450	$450	C-2	
10	1	EA	CREATIVE LABS	70SB040000005	Sound Blaster Audigy 2 Value - sound card	$75	$0	$75	$75	C-2	
11	1	EA	PNY TECHNOLOGI	VCQ4400NVS-PB	Quadro4 NVS400 PCI 64MB	$397	$0	$397	$397	C-2	
15	4	EA	PLANTRONICS	.AUDIO50	Monaural PC Headset	$12	$48	$0	$48	I-2	
16	1	EA	LOGITECH	961239-0403	Quickcam PRO 4000 Video	$100	$100	$0	$100	I-2	
17	1	PR	LABTECH	970082-0403	Spin 75 Speaker	$18	$18	$0	$18	I-2	
18	1	EA	CABLES TO GO	20360	6ft VALUE SERIES 3.5mm STEREO PLUG to 3.5mm STEREO JACK	$6	$6	$0	$6	I-2	
						SUBTOTAL	$172	$2,584	$2,756		